DOCUMENT RESUME

ED 042 640 SE 009 766

TITLE	[Conservation Units.]
INSTITUTION	Texas Education Agency, Austin.
PUB DATE	[70]
NOTE	118p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$6.00
DESCRIPTORS	*Conservation Education, *Environmental Education, *Instruction, *Instructional Materials, Interdisciplinary Approach, *Secondary Education, Teaching Guides

ABSTRACT

Instructional units deal with each aspect of conservation: forests, wildlife, rangelands, water, minerals, and soil. The area of the secondary school curriculum with which each is correlated is indicated. Lists of general and specific objectives are followed by suggested teaching procedures, including ideas for introducing the topic, questions to ask, demonstrations to perform and evaluation methods. Where appropriate, references to books, pamphlets, charts, films, and filmstrips for teacher reference or class use are provided. Specific examples given are concerned with the Texas environment. (AL)

ED042640

An Instructional Unit

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Recreational Values Of Forests

Senior High School

Correlate With Social Studies

SE 009 766

Recreational Values Of Forests

I. Forest Conservation

II. The Recreational Values of Forested Areas

III. Objectives

A. General Objectives

1. To develop an understanding of the meaning of the term "natural recources"

2. To develop an understanding that some natural resources, as trees, are renewable and some are not

3. To develop an understanding of man's dependence upon forest resources

4. To develop an understanding that forest conservation means the wise use of our forest resources

5. To develop an understanding that forest conservation practices provide more resources for more people for longer periods of time

6. To develop an understanding that forest conservation practices exemplify man living in harmony with nature

7. To develop an understanding that the effectiveness of our forest conservation program depends on the attitude of our citizens

8. To develop an understanding that all living things are interrelated and interdependent

B. Specific Objectives

1. Develop an understanding that forests not only provide wood products used in our daily life, but flood prevention, wind erosion, soil erosion, recreation, habitat for wildlife, employment for thousands of people, and aesthetics

2. Develop an understanding of the importance of outdoor recreation to our well-being

3. Develop an understanding of the factors which make a forested area suitable for recreational use

4. Develop an understanding of the principal forest regions of Texas and the major tree species found in each

5. Develop an understanding of the damaging effects forest fires not only do to our forest resources but to human life, homes, outbuildings, fences, pastures, etc

6. Develop an understanding of laws pertaining to forests in Texas

IV. Introduction of Topic

A. Questions

1. In what ways do forests provide recreation?

2. What types of recreation do our forests provide?

3. Do Texas forests provide recreation opportunities?

4. Can Texas forests provide year-round recreation? If so, what type and where?

5. What important features found in our forests help to provide an ideal recreational area?

6. How does wildlife depend upon the forest?

7. How many people derive recreation benefits from Texas' forests?

8. Does the forest provide anything other than recreation?

9. Why should our forests be protected?

B. Thought Questions

1. Are there opportunities for private woodland owners in Texas to develop a part of their land for recreational pursuits?

2. Should recreational areas be developed on privately owned forest areas?

3. Is recreational use of our forests economically feasible?

4. How far are people willing to travel to a forest recreation area? For picnicking, water sports, hiking, camping, hunting, fishing, etc?

5. What can man do to improve the recreational benefits of our forests?

6. What can man do to protect these benefits?

C. Demonstrations

1. Let each student pick out a month in the year and describe a suitable type of forest recreation. After each student has explained his topic the teacher may explain the need for protection of our forested areas before, during, and after each type of recreation

2. Invite a forester to demonstrate such themes as the following:

   a. Keeping our forest streams and lakes clean

   b. Good Camper manners

   c. Outdoor safety

   d. Littering

   e. Things to do and see on the State and National Forests in Texas

3. Plan the recreational development of a given forested area

D. Filmstrips, Motion Pictures, Material from State Agencies, Books

1. Filmstrips

   a. "Using Our Forest Wisely"

   b. "Forest Resources"

   c. "The Forest and Its Importance"

2. Motion Pictures

   a. "Everyman's Empire", Forest Service; 18 minutes; color; United States Department of Agriculture; Washington

3. Assistance from Government Agencies

   a. Texas Forest Service, College Station

   b. U. S. Department of Agriculture--U. S. Forest Service; Soil Conservation Service

   c. Texas Education Agency, Austin

   d. National Forests in Texas, Forest Supervisor, Texas National Forests, Lufkin

   e. U. S. Department of Interior

      (1) Bureau of Outdoor Recreation

      (2) National Park Service

      (3) Fish and Wildlife Service

V. Body of Unit

A. Procedure

1. Let students prepare a definition of forestry

2. Develop a code of outdoor manners built around the individual's responsibility

    a. Preventing and reporting fires in and near forested areas

    b. Proper disposal of rubbish

    c. Keeping our streams and lakes clean

    d. Keeping campsites and picnic facilities in a sanitary and attractive condition

    e. Respecting the property rights of others

3. Discuss desirable attitudes and behavior of recreation area users

B. Content

1. Other uses of the forest where recreation is the major use

    a. Grazing

    b. Watershed protection

    c. Wildlife habitat

    d. Source of wood and wood products

2. Location of major Forest Recreational Areas in Texas

    a. Private

        (1) Industrial

        (2) Farm woodlands

    b. Public

        (1) National forests

        (2) National parks

        (3) State forests

        (4) State parks

        (5) County and municipal

3. Problems

    a. Man-caused fires

b. Losses by insects and diseases

c. Increasing importance of recreation and demand for more areas

d. Decreasing area of forest land due to lakes, highways, transmission lines, urbanization

e. Littering and vandalism of recreational areas

f. Legal problems of public liability

4. Remedies

a. Protect forests from fire, insect pests, plant diseases and overgrazing

b. Motivate private woodland owners to practice more intensive forest management

c. Pass liability laws that will encourage private woodland owners to develop and open their woodlands for recreational activities

C. Activities

1. Visit a state or national forest

2. Prepare a scrapbook of the visit and include a written report of same

3. Individual Activities

a. A talk by each student on some form of forest recreation. Tell why the forest makes it possible for us to have this recreation

b. What can be done to continue and improve this recreation?

VI. Evaluation

A. Do the students know what forests give us?

B. Do they have an honest desire to conserve this natural resource?

C. Were experiences varied and interesting to pupils?

D. Were there opportunities for group participation, cooperation and individual initiative?

E. Were proper introductions and follow-ups made on each film and filmstrip used?

VII. Bibliography

A. Black, John D., Biological Conservation, New York, The Blakeston Company, Inc., 1954, pp. 10-12

B. Bush, Warren D., and Collingwood, C. H., Knowing Your Trees, Washington, D. C., The American Forestry Association, 1963, pp. 16-18, 34-35, 48-49

C. Foster, Albert B., Approved Practices in Soil Conservation, Danville, Illinois, The Interstate Printers and Publishers, Inc., 1964, pp. 21-30

D. McNall, P. E., Our Natural Resources, Danville, Illinois, The Interstate Printers and Publishers, Inc., 1964, pp. 1-7, 117-141

E. Renner, George T., Conservation of Natural Resources, London, John Wiley and Sons, Inc., 1942, pp. 40-41

F. Weaver, Richard L., Conservation Handbook, Danville, Illinois, The Interstate Printers and Publishers, Inc., 1964, pp. 51-99

G. The American Forestry Association, A Conservation Program For American Forestry, Washington, D. C., pp. 10-13

ED042640

An Instructional Unit

(Secondary School Conservation Unit)

Texas Minerals

(Other than Petroleum)

Grade Level: 8, 9, 10, 11, and 12

Correlated With:

Earth Science (8th Grade)

Chemistry (10th - 12th Grades)

Economics (10th - 12th Grades)

SE 009 766

I. Area of conservation involved: Minerals

II. Topic: Minerals (other than petroleum)

III. Objectives

A. General

1. To develop an understanding of minerals as natural resources
2. To develop an understanding of man's dependence upon mineral resources
3. To develop an understanding that although some natural resources are renewable, mineral resources are not
4. To develop an understanding of the importance of the mineral industry to an industrial society
5. To develop an understanding that conservation of minerals means the wise use of mineral resources
6. To develop the understanding that conservation practices help man to live in harmony with nature

B. Specific

1. To develop an understanding of the mineral industry
2. To develop an understanding of the role that geology has in the location of Texas mineral deposits
3. To learn what minerals are produced in Texas and how they are used
4. To learn how mineral deposits formed
5. To develop an understanding of how mineral deposits are discovered
6. To develop an understanding of how minerals are obtained

7. To develop an understanding of how minerals are transported
8. To develop an understanding of what the demands on the workers in the mineral industry are
9. To develop an understanding of some of the problems of the mineral industry
10. To develop an understanding of the conservation practices that can be applied to mineral resources

IV. Introduction

A. Motivation

1. Bulletin board and other displays

a. Maps that show the areas of outcropping strata in Texas.

b. Maps that show the location of mineral resources in Texas

c. Pictures of quarries and other Texas mineral operations

2. Obtain samples of some Texas minerals and of the products into which they are converted

B. Questions designed to find out what the student knows about mineral resources

1. What is a mineral?
2. What is a rock?
3. What is an ore?
4. What is a mineral resource?
5. Why are mineral resources important?
6. What are some of the mineral resources of Texas?

7. How are mineral resources obtained from the ground?

8. Why should we conserve our mineral resources?

C. Thought-provoking questions

1. What mineral resources are used as energy sources?

2. What mineral resources are used as materials?

3. What mineral resources are used to sustain life?

4. What relation do mineral resources have to our way of life?

5. How is the production of mineral resources related to population trends? To our standard of living?

6. How do mineral resources differ from other natural resources (in terms of their nonrenewability)?

7. How can we conserve our mineral resources?

V. Body of the unit

A. Procedure

1. Place an eye-catching display of some Texas mineral resources and mineral products in the classroom

2. Ask questions designed to find out what the students know about mineral resources

3. Present the thought-provoking questions

4. Originate activity programs

a. Class discussion led by teacher

b. Class discussion led by some member of the mineral industry

5. Use audio-visual materials

6. Visit a nearby mine, pit, quarry, cement or lime plant, etc., and follow the mineral from quarry to finished product. Consider the investment necessary to make a useful product such as a brick or a barrel of cement
7. Presentation of pupil reports
8. Evaluative procedure

B. Content

1. Importance of the mineral industry

a. What is the total annual mineral production value in the United States, including petroleum? What is the total value, excluding petroleum? What percentages of these totals are produced in Texas? Compare this total value with the value of agricultural products and manufactured products

b. What was the value of Texas mineral production in 1900? In 1962?

c. What was the population of Texas in 1900? In 1962?

d. How is population related to mineral production?

e. How does the mineral industry contribute to the economy of Texas? How many people does it employ (including petroleum)? How much does it pay in taxes? What other kinds of businesses depend on it?

f. Why should Texas encourage the development of as great a variety of mineral industries as possible?

2. The relation of geology to the mineral deposits of Texas

   a. What are igneous, metamorphic, and sedimentary rocks? In what areas of Texas can these rocks be seen at the earth's surface? What mineral deposits occur in these areas?

   b. What are the major divisions of geologic time? Which of the above kinds of rocks are found in the geologic formations that formed in Texas during Precambrian time? During Paleozoic time? During Mesozoic time? During Cenozoic time? Where are the areas of outcrop of the Precambrian, Paleozoic, Mesozoic, and Cenozoic rocks in Texas? What mineral deposits occur in each of them?

3. The kinds and uses of Texas mineral resources

   a. List some of the metals that are produced in Texas. What are some of the uses of iron, magnesium, and uranium?

   b. List some of the nonmetallic (industrial) metal resources that are produced in Texas. What are some of the uses of clay, gypsum, salt, sand, gravel, limestone, sandstone, granite, sulfur, talc, soapstone, asphaltic limestone, barite, basalt, lignite, rhyolite, graphite, and pumicite?

   c. Which are more important in the Texas economy, the metallic or the nonmetallic mineral resources?

   d. List some of the Texas mineral resources that are used because of their chemical composition

e. List some of the Texas mineral resources that are used because of physical properties other than chemical composition

f. In terms of monetary value, which are the three most important mineral resources, excluding petroleum, that are produced in Texas?

4. The origin of mineral deposits

a. How did the limestone deposits form?

b. How did the salt domes form?

c. How did the Texas graphite deposits form?

d. How did the granite deposits form?

e. How did the lignite deposits form?

f. How does knowing the geology of an area enable you to predict the kinds of mineral deposits that might occur there?

5. How minerals are found

a. How is geology used to prospect for minerals?

b. How is physics used to prospect for minerals?

c. How is chemistry used to prospect for minerals?

6. How minerals are obtained

a. What is an open-pit mine? A strip mine? A quarry? Which Texas mineral resources are obtained in this way? What equipment is used?

b. What is the Frasch method of mining? What Texas mineral resource is obtained in this way?

c. What Texas mineral resources are obtained from the waters of the Gulf of Mexico? Can you describe this process?

d. What Texas mineral resources are obtained from underground mines? In what other way is salt obtained in Texas?

7. How Texas mineral resources are transported

a. What mode of transportation--truck, rail, or water--carries the most Texas mineral resources?

b. Why is the distance that some Texas mineral resources have to be transported to market an important consideration?

8. Workers in the Texas minerals industries

a. How many workers are employed in the production of Texas minerals (excluding petroleum)?

b. What are some of the hazards faced by workers in Texas mineral industries? How are they protected against the dangers of explosives, cave-ins, heat, dust, radiation, etc.?

c. What skills are needed by workers in the mineral industries?

d. What effects do changes in methods of mining and processing have on workers? What effect do they have on the number employed? What effect do they have on wages and salaries?

9. Some of the problems of the mineral industry

a. In what way does the location of a mineral deposit affect the value and potential use?

b. Why is the size of a particular mineral deposit an important consideration?

c. Why is the grade or purity of a mineral deposit of importance?

d. What bearing does the current market demand have on the desirability of producing a particular mineral deposit?

e. How do production costs help determine whether or not a mineral deposit is of value?

10. Conservation of mineral resources

a. Should mineral resources remain unused or hoarded in order to conserve them?

b. How do mineral resources contribute to the standard of living of the people?

c. How can an adequate and continuing supply of mineral resources be obtained to satisfy the needs of an increasing population and an expanding economy?

d. How would a thorough inventory of mineral deposits, a continuing search for new deposits, the compilation of reserve estimates, the preparation of maps showing the areas of outcrop of the geologic formations, and the gathering of other data aid in the development of conservation plans and policies?

e. How can geological and engineering surveys of urban and suburban areas and zoning laws formulated by City, County, and State governments help in the conservation of mineral resources? Can you give an example?

f. After a mineral deposit has been removed from an area, how could the abandoned pits and quarries be used?

g. What is meant by using a mineral resource at its highest potential? Can you give an example? Would this be sound conservation practice?

h. How are operating and beneficiation methods, as well as the rate of development of mineral deposits, related to conservation? Can the developer of a mineral deposit be encouraged to use it wisely? How?

i. Can any mineral materials be recovered from scrap? Can you give some examples?

j. Can you name some materials that might be substituted for scarce mineral resources?

k. How does war affect the use of mineral resources?

C. Activities

1. Field trips
2. Lecture by teacher
3. Lecture by some member of the mineral industry
4. Pupil reports
5. Locate mineral producing areas of Texas on a map
6. Panel discussion on how specific minerals are mined, processed, and used

VI. Evaluation procedure

A. Paper and pencil tests--questions should be prepared so as to determine whether the general and specific objectives have been obtained

B. Class discussion in which students are motivated to answer oral questions

C. Composition exercise with these suggested topics:

"The Conservation Measures That Can Be Applied to Texas Mineral Resources"

"Uses of Texas Mineral Resources"

"The Economic Importance of Texas Mineral Resources"

"Ways I Use Mineral Resources in Everyday Life"

D. Physical check to see if available resource materials were adequately used.

1. Do you have materials that were not used?
2. What materials do you need as replacements or additionals?
3. Did you try to obtain additional information?

VII. Bibliography

Flawn, P. T. (1965) Texas mineral resources; problems and predictions: Univ. Texas, Bureau of Economic Geology Geological Circular 65-2, 17 pp. Discusses the past, present, and future of the Texas mineral industry and describes how wise planning can help conserve our mineral resources.

Gillson, J. L., editor (1960) Industrial minerals and rocks (nonmetallics other than fuels): American Institute of Mining, Metallurgical and Petroleum Engineers, New York, 934 pp. Discusses the kinds, properties, geology, occurrences, mining and preparation, prices, and uses of industrial minerals; includes extensive bibliographies

Girard, R. M. (1964) Texas rocks and minerals, an amateur's guide: Univ. Texas, Bureau of Economic Geology Guidebook 6, 109 pp. Describes in nontechnical terms the kinds, composition, origin, occurrences, and uses of many Texas rocks and minerals; includes an areal geologic map of Texas and lists of references

Girard, R. M. (1965) Texas mineral producers (exclusive of oil and gas): Univ. Texas, Bureau of Economic Geology, 91 pp. Lists the producers of Texas mineral resources by county and by resource; indicates the geologic strata from which the resources are obtained

McDivitt, J. F. (1965) Minerals and men: Published for Resources for the Future, Inc., by The Johns Hopkins Press, Baltimore, Md., 158 pp. Describes problems that relate to mineral supply, discusses specific minerals in order to present certain characteristics of the mineral industry, and views the technology and economic significance of the mineral industry

Netzeband, F. F., and Girard, R. M. (1964) The mineral industry of Texas in 1963: U. S. Bureau of Mines Minerals Yearbook, 1963, preprint; issued as Univ. Texas, Bureau of Economic Geology Mineral Resource Circular 46, 63 pp. An annual report that lists kinds and value of minerals produced in Texas counties; includes employment data and detailed statistical information for selected mineral resources of the State

Nichols, H. L., Jr. (1962) Moving the earth, the workbook of excavation, 2nd edition: North Castle Books, Greenwich, Conn., 21 chapters An engineering reference book that gives detailed information about excavation techniques and machinery; includes many diagrams and illustrations

Riley, C. M. (1959) Our mineral resources, an elementary textbook in economic geology: John Wiley and Sons, Inc., New York, 338 pp. Discusses the origin and worldwide occurrences of mineral resources and briefly discusses their importance and exhaustibility; includes selected references.

Robie, H., editor (1964) Economics of the mineral industries, 2nd edition: American Institute of Mining, Metallurgical and Petroleum Engineers, New York, 787 pp. Includes chapters on the significance of the mineral industry, on mining methods and treatment, on operating costs, on marketing, and on conservation; lists many references.

Sellards, E. H., Baker, C. L., and others (1935) The geology of Texas, Vol. II, Structural and economic geology: Univ. Texas Bulletin 3401 (Jan. 1, 1934), 884 pp. (out of print). Discusses the kinds, occurrences, geology, and uses of Texas mineral resources and includes detailed descriptions of selected mineral deposits

Sellards, E. H., and others (1946) Texas mineral resources: Univ. Texas Publication 4301 (Jan. 1, 1943), 390 pp. Includes an index of Texas mineral resources by county and by resource, a mineral locality map (out of print), maps showing distribution of certain industrial minerals, and detailed descriptions of selected mineral deposits

U. S. Bureau of Mines Staff (1960) Mineral facts and problems: U. S. Bureau of Mines Bulletin 585, 1116 pp. Discusses the geology, mining, processing, and uses of mineral raw materials, and describes problems of the mineral industry

Maps

Sellards, E. H., and others (1933) Geologic map of Texas: Univ. Texas Bulletin 3232, part 5; scale: 1 inch equals 31.56 miles

Oetking, P. E. (1963) Geological highway map of Texas: Dallas Geological Society, Box 2867, Dallas Texas; scale: 1 inch equals about 30 miles

Sellards, E. H., and others (1946) Maps of Texas showing distribution by counties of certain industrial minerals and mineral substances: Univ. Texas Publication 4301, Plates 21-28

Sellards, E. H., Evans, G. L., and Hendricks, Leo (1944) Mineral locality map of Texas: Univ. Texas Publication 4301, Plate I; scale: 1 inch equals 15.78 miles (out of print)

Films

The Magic of Sulphur, 16 mm., sound, color, 30 min. U. S. Bureau of Mines, Graphic Services, 4800 Forbes Avenue, Pittsburgh 13, Pennsylvania

Rocks and Minerals, 16 mm., sound, color, 10 min., Univ. Texas, Visual Instruction Bureau, Austin, Texas

The Story of Limestone, 16 mm., sound, color, 27 min., Indiana Limestone Institute, Box 757, Bloomington, Indiana

Texas and Its Natural Resources, 16 mm., sound, color, 43 min., Univ. Texas, Visual Instruction Bureau, Austin, Texas

Treasures of the Earth (Elementary Science Series), 16 mm., sound, color, 10 min., Univ. Texas, Visual Instruction Bureau, Austin, Texas

White Wonder, 16 mm., sound, color, 28 min., Morton Salt Co., distributed by Modern Talking Picture Service, 3 East 54th St., New York 22, N. Y.

ED042640

AN INSTRUCTIONAL UNIT

TEXAS MINERALS
(Petroleum)

Junior High School Level

Correlate with Texas History and Geography

or Earth Science

SE 009 166

I. Area of conservation involved: Minerals

II. Topic: Petroleum

III. Objectives:

A. General

1. To develop an understanding of petroleum as a natural resource.

2. To develop an understanding of man's dependence upon natural resources.

3. To develop an understanding that some natural resources are renewable and some are not.

4. To develop an understanding that conservation means the wise use of our natural resources.

5. To develop the understanding that conservation practices require that man must live in harmony with nature.

B. Specific

1. To develop an understanding of the petroleum industry.

2. To develop an understanding of what oil is.

3. To develop an understanding of the uses of oil.

4. To develop an understanding of how oil is obtained.

5. To develop an understanding of how oil is transported.

6. To develop an understanding of what the demands on the workers in the oil industry are.

7. To develop an understanding of some of the major problems of the oil industry.

IV. Introduction

A. Motivation:

1. Bulletin board and other displays.

2. Arrange information center.

3. Secure oil and core samples to aid in discussions of where oil is found.

B. Questions designed to find out what the student knows about petroleum.

1. Where does petroleum come from?

2. How did oil get into the ground?

3. Why is petroleum important?

4. Is there petroleum in other parts of the world?

5. How do we get petroleum out of the ground?

6. What mineral production is most important to the place where you live?

7. Why should we conserve petroleum?

C. Thought-provoking questions:

1. What is made from petroleum?

2. Who uses petroleum products?

3. How is oil refined?

4. How can we help conserve our petroleum?

5. Why is petroleum our most important source of fuel?

6. Why is it dangerous to work on an oil well?

7. In what ways do minerals influence the number of people living in an area?

8. Why is Houston important as a center for the petroleum industry?

V. Body of the unit

A. Procedure

1. Place eye catching display of petroleum products and an oil well on the bulletin board.

2. Ask questions designed to find out what the students know about petroleum.

3. Present the thought-provoking questions.

4. Originate activity program.

a. Class discussion led by teacher.
b. Class discussion led by some member of the oil industry.

5. Use audio-visual materials.

6. Visit a local oil refinery or oil field to view an oil well.

7. Presentation of pupil reports.

8. Evaluative procedure.

B. Content:

1. Importance of the petroleum industry.

a. What is the production of oil by the United States?

b. What percentage of oil produced in the United States is produced in Texas?

c. How many people in Texas are employed in the producing and processing of petroleum?

2. What is oil?

a. What is the composition of oil?

b. What is the length of time that oil was in the making?

c. What are the earth formations in which oil is found?

d. Where are the oil fields of Texas?

(1) Where was the first oil well drilled in Texas?

(2) What is the story of the discovery of oil in Texas?

e. What oil fields are located outside of Texas?

3. The uses of oil.

a. What were the initial uses of oil?

(1) What is the earliest known use of oil?

(2) What use made it sufficiently profitable to drill?

(3) What are some of the uses of oil today?

b. What are some of the by-products of petroleum?

(1) Are by-products likely to become important?

(2) How may rubber be made from petroleum?

c. What effect has war on the use of petroleum?

4. How oil is obtained.

a. How oil wells are drilled.

(1) How have new processes of drilling affected the production of oil?

(2) What is the relation of natural gas to the drilling of oil?

b. What is the possibility of securing oil from new sources?

5. How oil is transported.

a. How is oil transported on water?

(1) How have special freighters been devised to carry oil?

(2) What are the chief sea routes used in the transportation of oil?

b. How is oil transported on land?

(1) How have changes been made in the railroad car?

(2) How has the use of pipe lines increased? Where are they?

(3) What is the story of the first pipe line?

c. How is oil transported in the air?

6. Demands on the workers in the oil industry.

a. What peculiar dangers do workers in oil fields face?

(1) How are they protected against such dangers?

b. What skills are needed by workers in the oil industry?

c. What effects do changes in ways of drilling and processing have on workers?

(1) What effect do they have on the number employed?

(2) What effect do they have on wages and salaries?

C. Activities:

1. Field trips.

2. Lecture by teacher.

3. Lecture by some member of the oil industry.

4. Pupil reports.

5. Locate the oil producing areas of Texas on a map.

6. Panel discussion on how oil is refined.

VI. Evaluative Procedure

A. Paper and pencil tests-questions should be constructed so as to determine whether the general and specific objectives have been obtained.

B. Class discussion in which students are motivated to answer oral questions.

C. Composition exercise with these suggested topics:

"What Does Conservation of Petroleum Mean to Me"
"Uses of Petroleum in Texas"
"Problems of The Petroleum Industry"
"How Petroleum is Obtained"
"The Economic Importance of Petroleum"
"Ways I Use Petroleum in Everyday Life"

D. Physical check to see if available resource materials were adequately used.

1. Do you have materials that were not used?

2. What materials do you need as replacements or additionals?

3. Did you try to obtain additional information?

VII. Bibliography

Conservation in the Production of Petroleum. Erich Zimmermann, Yale University Press, 1957.

Conservation in the Texas Petroleum Industry. Dallas: Oil Information Committee of Texas Mid-Continent Oil & Gas Association, 2920 Southland Center, n.d.

Conservation of National Resources. George T. Renner, John Wiley and Sons, New York, 1942.

Facts About Oil. American Petroleum Institute, 1271 Avenue of the Americas, New York, n.d.

History of Texas Oil. Dallas: Oil Information Committee of Texas Mid-Continent Oil and Gas Association, 2920 Southland Center, n.d.

New Geography of Texas. Frances Potts and John Lewis, Noble and Noble, Publishers, Inc., 1965.

Oil for Today and Tomorrow. Interstate Oil Compact Commission, Oklahoma City, Oklahoma, n.d.

Spindletop. James Clark and Michel Halbouty, Random House, 1952.

Story of Petroleum. Shell Oil Company, Public Relations Department, New York, n.d.

Teaching Unit on Petroleum. Dallas: Oil Information Committee of Texas Mid-Continent Oil & Gas Association, 2920 Southland Center, n.d.

The American Petroleum Industry: The Age of Energy. Harold F. Williamson, Ralph L. Andreano, Arnold R. Daum and Gilbert C. Klose, Northwestern University Press, 1963.

The American Petroleum Industry: The Age of Illumination. Harold Williamson and Arnold Daum, Northwestern University Press, 1959.

The Story of Oil. Mary June Burton, American Petroleum Institute, 1271 Avenue of the Americas, New York, n.d.

Wonders From Oil. American Petroleum Institute, 1271 Avenue of the Americas, New York, n.d.

Charts and Maps

Texas Oil and Gas Fields Map. Dallas: Oil Information Committee of Texas Oil & Gas Association, 2920 Southland Center, n.d.

Texas Oil Pictures. Dallas: Oil Information Committee of Texas Mid-Continent Oil & Gas Association, 2920 Southland Center, n.d.

The World Map. American Petroleum Institute, 1271 Avenue of the Americas, New York, n.d.

Transportation Since 1775. American Petroleum Institute, 1271 Avenue of the Americas, New York, n.d.

Films

Barrel Number One, 16mm, sound, black and white, 29 minutes.

Conserving a Heritage, 16mm, color, sound, 16½ minutes.

It Never Rains Oil, 16mm, color, sound, 15 minutes.

The above films can be obtained from: Oil Information Committee of Texas Mid-Continent Oil and Gas Association, 2920 Southland Center, Dallas, Texas. (Free on Loan)

Mineral Resources, 32 frames, color, Curriculum Films, New York.

Prospecting For Petroleum, 16mm, sound, color, 23 minutes, Shell Oil Company, Houston, Texas.

Texas and Its Natural Resources, 16mm, sound, color, 27 minutes, United States Department of the Interior, Pittsburgh, Pennsylvania.

ED042640

An Instructional Unit

Range Improvement Practices and Benefits

Junior High School Level

Correlate with Science

SE 009 166

Range Improvement Practices and Benefits

I. Area of Conservation Involved: Range Conservation

II. Topic: Range Improvement Practices and Benefits

III. Objectives

A. General Objectives

1. To develop an understanding that conservation means the wise use of our natural resources

2. To develop an understanding that many conservation practices exemplify man living in harmony with nature

3. To develop an understanding of man's dependence upon natural resources

4. To develop an understanding that some natural resources are renewable and some or not

5. To develop an understanding that all living things are interrelated and interdependent

B. Specific Objectives

1. To develop an understanding of the nature of a range

2. To develop a knowledge of what is meant by range conditions

3. To develop an understanding of the economic value of ranges

4. To develop an understanding of the relationship between conservation of soil and water and range

5. To develop an understanding of wise range-use practices

6. To develop an understanding of unwise range-use practices

IV. Introduction

A. Motivation

1. Bulletin board and other displays

2. Arrange information center

B. Questions designed to determine what students know about range conservation

1. What is range land?

2. Is there any range land in your community?

3. What are some range improvement methods?

C. Thought-provoking questions

1. Who benefits from rangeland?

2. Is range land renewable?

3. Does range conservation concern the individual citizen?

4. Does Range Conservation concern engineers of large water storage dams?

5. What is happening to the State's rangelands?

D. Films

1. "Raindrops and Soil Erosion", USDA, Soil Conservation Service - Film

2. "Frontiers of Grass" (filmstrip) USDA, 1939

3. "Gods Own Country" USDA

4. "Rebuilding with Grass" (motion picture) USDA, 1952

5. "Four Seasons West", USDA

6. "Grass and Cattle" (motion picture), USDA, 1950

7. "Richer Range Rewards" (motion picture), USDA 1946

E. Demonstrations

1. Splash - Raindrop method to determine the value of a good ground cover

2. Water Permeability test to determine amount of water taken into the soil by grassed range and bare ground

V. Body of the Unit

A. Procedure

1. Place eye-catching display of pictures or photographs of good and bad range conditions on the bulletin board and/or develop information center

2. Ask the questions designed to find out what the students know about range conservation

3. Present the thought-provoking questions

4. Originate activity program

   a. Class discussion led by teacher

   b. Class discussion led by local range conservationist

5. Use audio-visual material

6. Presentation of pupil demonstrations and reports

7. Make use of excursion method

   a. Field trip to local points of interest

   b. Organize field trip with local soil conservation district supervisor

B. Content

1. Types of Range Conservation Practices

   a. deferred rotational grazing

   b. proper use of grass

   c. brush control

   d. proper stocking rates

2. Benefits from Range Conservation Practices

   a. Deferred Rotational Grazing

      (1) Specific areas are grazed at different seasons of the year

      (2) Better grasses have a chance to recover or maintain themselves

      (3) Grasses makes more tonage per acre

      (4) Climax grasses crowd out poor grass

      (5) Livestock get a change of location

      (6) More beef per acre can be produced from year to year

   b. Proper use of grass

      (1) Only 50% of the vegetative growth is grazed

      (2) Grasses maintain themselves properly

      (3) Grasses have a chance to produce seed

(4) Climax grasses crowd out poor grasses

(5) More tonage per acre is produced

c. Brush Control

(1) Produces grazing for sheep and goats

(2) Allows climax grasses to take over

(3) More beef per acre is produced

(4) Allows the range to recover

d. Proper stocking rates

(1) Climax grasses maintain themselves

(2) Invading or poor grasses are kept under control

(3) Invading brush is not allowed to get a start

(4) More beef per acre is produced from year to year

(5) Range is left in good condition for the next generation

(6) Soil absorbs in the maximum amount of water

(7) Erosion is cut down to a minimum

3. Significance of range conservation

a. Range lands can be conserved

b. Grass is a renewable resource

c. We depend on range land for the meat we eat

d. Range conservation is the obligation of one generation to the next

4. Study of local range conservation practices

a. Present local practices

b. Effectiveness of local practices

c. Needed improvements

C. Activities

1. Field trips

2. Laboratory experiences

3. Demonstrations by teacher, and pupils

4. Pupil reports

5. Preparation of conservation exhibits

D. Continuity through the grades

This unit can be correlated with life or earth science. Other units in range conservation have been developed for the elementary school and for the senior high school. These three units, together with units prepared for other resource areas, should provide a total program which meets the general objectives of conservation education.

VI. Evaluative procedures

A. Paper and Pencil Test

Questions designed to determine whether the general and specific objectives have been reached

B. Class discussion in which the children are motivated to answer oral question

C. Composition exercise with these suggested topics

1. "What range conservation means to me"

2. "How economic conditions can be improved through range improvement"

3. "Local range conditions that need improving"

4. "Range Conservation in the national economy"

5. "Types of Range conservation practices in our community"

6. "The most important rangelands in our country"

D. Physical check to see if available resource materials were adequately used

1. Were available materials not used?

2. Are materials needed as replacements for those used up?

3. Are additional materials needed?

4. Are additional reading materials needed?

VII. Bibliography

A. Printed Materials

1. Grafts & Robbins, Weed Control, McGraw-Hill Book Company

2. Dow Chemical Company, Weed, Grass & Brush Control Handbook, (Booklet)

3. Journal of Range Management, The American Society of Range Management, Vol. 16, January, 1963, No. 1

4. Journal of Range Management, The American Society of Range Management, Vol. 16, March, 1963, No. 2

5. Judging Condition & Utilization of Short-grass Ranges, Farmers Bulletin No. 1949, USDA

6. Lancaster, James, Bailey & Harris, Pastures, Turner E. Smith & Co., Georgia

7. Lush, R. H., Pasture Production & Management, The Blakiston Co. Inc., New York

8. Pasture and Range Reserving Techniques, Comstock Publishing Associates, New York, 1962

9. Range Condition Publication, 1958, SCS, Washington

10. Soil & Water Magazine, Vol. 11, No. 4 Conservation Incorporated, Temple

11. Soil & Water Magazine, Vol. 11, No. 6 Conservation Inc., Temple

12. Stoddart and Smith, Range Management, McGraw-Hill Book Co. Inc., New York

13. Texas Agriculture Extension Service, Proper Grazing = More Profit, MP-259

14. Texas State Soil Conservation Board, Activities of the Texas State Soil Conservation Board and Soil Conservation Districts, Biennial Report, Sept. 1, 1958 - Aug. 31, 1960

15. Yearbook of Agriculture, 1958, USDA

B. Audio-visual Materials

1. Slides or films or filmstrips obtained from your local SCS Agent

2. USDA, "Raindrops and Soil Erosion"

3. USDA, "Frontiers of Grass", (filmstrip) 1939
4. USDA, "Gods Own Cow Country"
5. USDA, "Rebuilding with Grass", (motion picture) 1952
6. USDA, "Four Seasons West"
7. USDA, "Grass and Cattle", (motion picture) 1950
8. USDA, "Richer Range Rewards", (motion picture) 1946
9. USDA, "Home on the Range", (motion picture) 1946

CONSERVATION PLEDGE

I give my pledge as an American
to save and faithfully to defend
from waste the natural resources
of my country--its soil and min-
erals, its forests, waters and
wildlife.

ED042640

An Instructional Unit

Good Range Plants

Grade Level: 9-12

Correlate with Biology

SE 009 766

Good Range Plants

I. Area of Conservation Involved: Range Conservation

II. Topic: Good Range Plants

III. Objectives:

A. General objectives

1. To develop an understanding of man's dependence upon natural resources

2. To develop an understanding that conservation means wise use of our natural resources

3. To develop an understanding that many conservation practices exemplify man living in harmony with nature

4. To develop an understanding that conservation practices may provide more natural resources for more people for a longer period of time

5. To develop an understanding that some natural resources are renewable and some are not

B. Specific objectives

1. To develop an understanding of the nature of a range

2. To develop a knowledge of the kinds of plants which contribute to a good range

3. To develop a knowledge of the undesirable range plants

4. To develop an understanding of the relationship between conservation, soil and water and range

5. To develop a knowledge of what is meant by range conditions

IV. Introduction

A. Motivation

1. Bulletin board and other displays

2. Arrange information center

B. Questions designed to determine what students know about good range plants

1. What is a range?

2. What is a good range plant?

3. Why do we study range plants?

4. What are the factors that have been operating to produce local conditions in regard to good range plants?

C. Thought-provoking questions

1. Take some grass; look at it closely; what do you see?

2. Are range plants renewable?

3. How are good range plants lost?

4. Can you think of any place in this community where good range plants are decreasing? Why?

5. What does the conservation of good range plants mean to the individual?

6. What does the conservation of good range plants mean to the community?

7. What can you do to conserve good range plants where you live?

D. Films, Filmstrips, Slides, and Other Visuals

1. Grassland, Cen-Tex Film Library, College Station

2. More Good From Fewer Acres, Cen-Tex Film Library, Texas A&M College, College Station, (film)

3. In Common Cause, Cen-Tex Film Library, Texas A&M College

4. Frontier's of Grass; A Story of the Western Range, No. 585, USDA (filmstrip)

5. Rebuilding with Grass, USDA (film)

6. Richer Range Rewards, USDA (film)

E. Demonstrations:

1. Obtain examples of good range plants. Show students different parts of the plant

   a. seed head
   b. leaves
   c. stems
   d. roots (have different types if possible)

2. Obtain examples of poor range plants and compare with good ones, explaining why one is good and the other is poor

3. Secure material from local SCS Agent for display

V. Body of the Unit

A. Procedure

1. Place eye-catching display of good and poor condition range on bulletin board and/or develop information center

2. Ask questions designed to find out what the students know about grass range deterioration

3. Present the thought provoking questions

4. Originate activity program

a. Class discussion led by teacher

b. Class discussion led by resource person

5. Use audio-visual materials

6. Presentation of pupil reports

7. Make use of excursion method

a. Campus tour

b. Field trip to local points of interest

c. Organized field trip with local Soil Conservation Service Agent

B. Content

1. Range plants

a. Show mounted plants or live plants to students

b. Draw and label the parts of a plant

2. Growing seasons:

a. cool season

b. warm season

3. Life span of plants

   a. annual

   b. bi-annual

   c. perennial

4. Grazing value of range plants

   a. excellent

   b. good

   c. fair

   d. poor

5. Classification of plants as they respond to livestock grazing:

   a. Increaser-a plant that increases in abundance on the range when overgrazed

   b. Invader-plants which come in areas after the climax plants have been diminished by overgrazing, drought, or fire

   c. Decreaser-a plant that goes out when the range is overgrazed

   d. Climax-a plant native to the site before man disturbed the range by grazing and plowing

   e. Introduced-not native to the region or this country

6. Identify common range plants

   a. Collect samples of good range grasses

      (1) Big bluestem - Perennial, warm, climax, good; 3-6 ft. tall, seed head looks similar to turkey foot, usually comes out in threes. areas 1, 2, 3, 4, and 5

      (2) Little bluestem - Perennial, warm, climax, good; 2-4 ft. tall, bluish green, small fuzzy seeds with twisted awn, bunch grass, leaf blades tend to fold, after frost mature plants have reddish cast.* areas 1, 2, 3, 4, 5, 7, 8, and 9

      (3) Sideoats grama - Perennial, warm, climax, good;

* See map page 8

1-3½ ft. tall, seeds all along one side when ripe, hairs grow out of pimple-like spots on blade edge. areas 3, 4, 5, 6, 7, 8, 9, and 10

(4) Blue grama-Perennial, warm, climax, good; 1-2 ft. tall, usually two rooster comb-like spikes (seedhead) with no stinger present as there is in hairy grama. areas 7, 8, 9, and 10

(5) Rescuegrass-annual, cool, introduced, fair to good; 1-3 ft. tall, seedhead will resemble a fish body, turns straw yellow when ripe, known as wildrye in some areas, found frequently in ditches along roads in cool parts of the year. area 1, 3, 4, 5, 7, 8, and 9

(6) Buffalograss-Perennial, warm, climax, good; 4 in. - 1 ft. tall, resembles curlymesquite, or bermudagrass, has runners, joints are free of fuzz (slick like a buffalo nickel), male and female plants, seed resemble sack of candy that has been held for a long time at top with holes in the bo tom of it. areas 3, 4, 5, 6, 7, 8, and 9

(7) Bermudagrass-Perennial, warm, introduced, good; 4 in - 1 ft. tall, has runners, seedhead resembles a birds foot, found in your yard, river bottoms, etc. areas 1, 2, 3, 4, 5, and 7

(8) Canada wildrye-Perennial, cool, climax, good; 2-4 ft. tall, resembles wheat or barley, seedhead has a general curve, bunchgrass, found along in ditches, and bottomland in early spring a seedhead appears. areas 1, 3, 4, 5, 7, 8, and 9

(9) Curlymesquite-Perennial, warm, climax, fair; 4-10 in. tall, resembles bermudagrass, has hair at nodes, seedhead leaves a stem that zig-zags when seeds fall off. areas 4, 5, 6, 7, 8, and 10

(10) Vine-mesquite-Perennial, warm, climax, fair; 1-2 ft. tall, has runners several feet long, swollen joints and are slick, found along banks, streams, or ditches-bottomland, areas 3, 4, 5, 6, 7, 8, 9, and 10

(11) Switchgrass-Perennial, warm, climax, good; 3-6 ft. tall, grows in clumps, bluish blades up to 2 ft. long, in winter, seedhead resembles branches of a seeding willow tree. Found mostly along creeks and streams and protected areas. Disappears with heavy use. areas 1, 2, 3, 4, 5, 7, 8, 9

(12) Indiangrass-Perennial, warm, climax, good; 3-8 ft. tall, fuzzy nodes, half an arrow looking ligule; coarse blue blades. Seedhead 8-12 in. long and bronze to yellow in color. Bottomland and protected places. areas 1, 2, 3, 4, 5, 7, 8, and 9

(13) Johnsongrass-Perennial warm, introduced, good; 3-6 ft. tall, blades blue-green and often splotched with purple, found in fields, waste places, and ditches along road. areas 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10

(14) Texas wintergrass (Speargrass)-Perennial, cool, climax, good; 1-2 ft., and sometimes 3½ ft. tall, seed resemble a spear, blades rough feeling on underside, most abundant nature winter growing grass in texas, found in bottomland soil and mesquite flats. areas 3, 4, 5, 6, 7, 8, and 9

(15) Eastern Gamagrass-Perennial, warm, climax, good; 3-5 ft. tall, seedhead has one-three spikes, closely kin to corn, spikes 6-10 in. long, seed are found in lower ¼ of spike and when mature breaks at what resembles a joint, found in fertile bottomland soil-swamps and along stream banks. areas 1, 2, 3, 4, and 5 (See bibliography # 10 for added information and drawings of these grasses)

b. Collect samples of good range forbs

(1) Pitcher's sage-Perennial, warm, native, forb, good; 2-4 ft. tall, square stem, alternate opposite leaves from base of plant to the blooms, found on the prairie and plains through U. S., prefers well drained sites. areas 1, 2, 3, 4, 5, 7, 8, and 9

(2) Catclaw sensitive brier-Perennial, warm, native, legume, good; has spiney-like projections on main stems, lateral branches and seed rods, 2-3 ft. long, grows on ground, vine like, has pink clustered blossoms, in the early spring, decreases under overgrazing, grows in deep to shallow soils. areas 1, 2, 3, 4, 5, 8, and 9

(3) Prairie-coneflower - Perennial, forb, warm, native, good; 1-2 ft. tall, flowers bright yellow petals at base of a brown cone, found in meadows and protected areas. area 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10

(4) Halfshrub Sundrop - Perennial, warm, native, forb, good; 1-2 ft. tall, leaves are "troughlike", and have a notched appearance along edge, after about 3 or 4 seasons of growth plant becomes woody and resembles a small shrub. area 2, 3, 4, 5, 6, 7, 8, and 9

(5) Slender lespedeza - Perennial legume, native, warm, good; 1-3 ft. tall, clusters of small delicate purple flowers appear from August to September, leaves are narrow, rather long and generally in groups of three, found generally where soil is a clay or sandy loam. areas 1, 2, 3, 4, 5, and 7

(6) Sessile tickclover - Perennial legume, warm, native; 3-5 ft. tall, leaves smooth on top and fine hairs beneath, attached almost directly to stem, seed pods 1-3 jointed and point downward when mature, are covered by short stiff hair with hooked tips that will cling to clothing or animal coats, stem has some. areas 1, 2, 3, 4, 5, and 8
(Refer to bibliography #13 for more information and other good range plants)
(For explanation of other terms used refer to bibliography # 10)

7. Discuss mounting of plants

   a. How it is done

   b. Information needed for identification

8. Significance of Identifying good range plants

   a. That they can be conserved

   b. That good range plants are a renewable resource

   c. That we depend upon good range plants for many of our daily needs

   d. Conservation of good range plants is an individual responsibility

9. Study of local conservation practices

   a. Local practices

   b. Effectiveness of local practices

   c. Needed improvements

C. Activities

1. Field trips

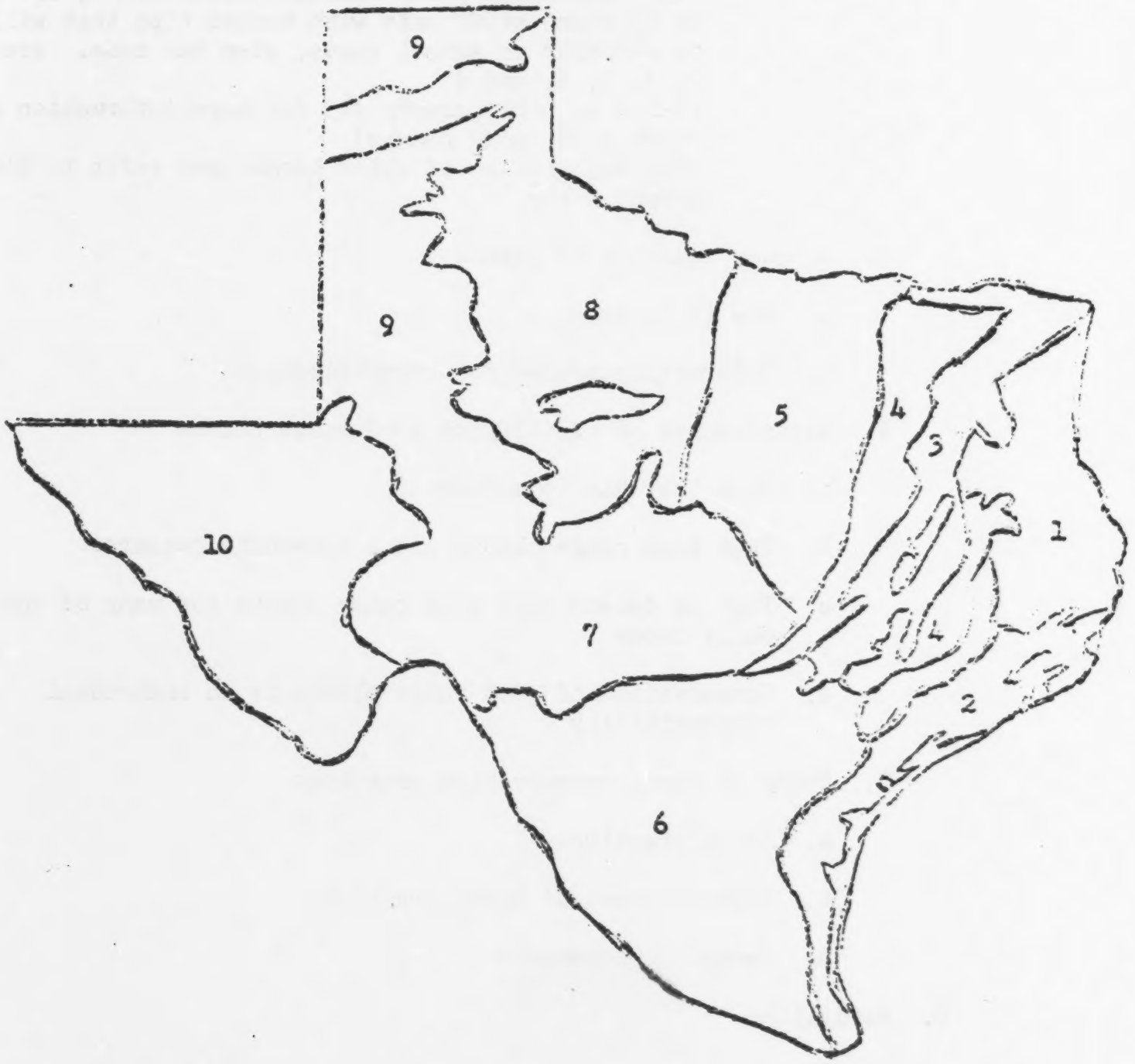
2. Laboratory experiences

3. Demonstrations by the teacher

4. Pupil reports

5. Preparation of exhibits on good practices

VEGETATIONAL AREAS OF TEXAS



Taken from publication of Texas Agricultural Extension Service..... Texas Agricultural Experiment Station Bulletin, L-492.

D. Continuity through the grades

This unit is related to the study of living things. The study of living things is taught in most all grades, 1-12. Other conservation units on range resources are available for the elementary and the junior high school

VI. Evaluative procedures

A. Paper and pencil tests

Questions designed to determine whether general and specific objectives have been reached

B. Class discussion in which children are motivated to answer oral questions

C. Composition exercise with these suggested topics

1. "What Does Conservation of Good Range Plants mean to Me"

2. "Local Conditions That Need Improving"

3. "Reseeding Range Land"

4. "Local Conditions that Have Been Improved"

5. "Grass, the Ranchers Crop"

6. "Why I Should Be Able to Identify Good Range Plants"

7. "What a Good Range Is"

D. Physical Check to see if available resource materials were adequately used.

1. Do you have materials that were not used?

2. Were materials needed that were not available?

3. Were there adequate reading and reference materials?

VII. Bibliography

A. Printed materials

1. Coastal Bermuda, Texas Agriculture Extension Service, MP-519 (Bulletin)

2. Do You Know Your Range, Texas Agriculutre Extension Service, B-864, (Bulletin)

3. Grass Crops in Conservation Farming, USDA, 2080, (Pamphlet)

4. Grass for Conservation in the Southern Great Plains, FB-2093, USDA (Pamphlet)

5. Grassland-Livestock Handbook, University of Oklahoma Press, (Booklet)

6. Grass---the Ranchers Crop, L-346, USDA (Bulletin)

7. Indicators of Southwestern Range Conditions, USDA, FB-1782, (Bulletin)

8. Johnsongrass as a Forage Crop, Texas Agriculture Extension Service, L-336, (Leaflet)

9. Judging Condition and Utlization of Short-Grass Ranges of the Central Great Plains, USDA, FB-1949, (Bulletin)

10. Know Your Grasses, Texas Agricultural Extension Service, B-182, (Bulletin)

11. Nature Grasses, Oklahoma A & M Extension Service, Oklahoma City Oklahoma, (Pamphlet)

12. Our Land and Its Use, National Plant Food Institute, 1700 K St. N. W., Washington

13. Pasture and Range Plants, Sections 1-6, Phillips Petroleum Co. Bartlesville, Oklahoma

14. Pricklypear---Good or Bad?, Texas Agricultural Extension Service, B-806, (Bulletin)

15. Proper Grazing-More Profit, Texas Agricultural Extension Service, MP-259, (Bulletin)

16. Range Conditions Publications, 1958, Soil Conservation Service, Washington, D. C., (Bulletin)

17. Range Grasses, Texas Agricultural Extension Service, MP-164, (Bulletin)

18. Range Plants of Texas, Texas Agricultural Extension Service, B-236, (Bulletin)

19. Seed for Regrassing Great Plains Area, USDA, FB-1985, (Bulletin)

20. Vegetative Areas of Texas, Texas Agricultural Extension Service L-492

21. Weed, Grass and Brush Control Handbook, Dow Chemical Co., $0.50, (Booklet)

22. Year Book of Agriculture, USDA, 1958, (Book)

23. Texas Plants, A Checklist & Ecological Summary, Texas Agricultural Extension Service, MP-585, (Booklet)

B. Audio-visual Aids

1. Frontiers of Grass; A Story of Western Range Conditions, USDA, No. 585, (Filmstrip)

2. Grassland, Cen-Tex Film Library, College Station, (Film)

3. In Common Cause, Cen-Tex Film Library, College Station, (Film)

4. More Good From Fewer Acres, Cen-Tex Film Library, College Station, (Film)

5. Rebuilding with Grass, USDA, (Film)

6. Richer Range Rewards, USDA, (Film)

CONSERVATION PLEDGE

I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country--its soil and minerals, its forests, waters and wildlife.

ED042640

An Instructional Unit

Conservation and Resource Use of the Oceans

Senior High School Level

This unit is intended to be used in any area of science studying the oceans on the secondary level. There are sufficient references provided to cover the fields of Biology, Earth Science, Geology, Physics, and Oceanography

SE 009 766

Conservation and Resource Use of the Oceans

I. Area of Conservation Involved: Water

II. Topic: Conservation and Resource Use of the Oceans

III. Objectives:

A. General Objectives:

1. To develop an understanding of the term "natural resource" as regards the use of the oceans

2. To develop an understanding of man's dependence upon the sea as a vast natural resource

3. To develop an understanding that the oceans as a natural resource are sometimes renewable and sometimes not

4. To develop an understanding that conservation means the wise use and proper handling of this worldwide resource

5. To develop an understanding that the practice of conservation now will provide more material resources for more people for a much longer period of time

6. To develop an understanding that many conservation practices exemplify man living in harmony with nature

7. To develop an understanding that the effectiveness of our conservation program depends upon the attitude of our citizens

8. To develop an understanding that all living things are interrelated and interdependent

9. To develop an understanding that our very survival depends upon the conservation of some of our non-renewable natural resources

B. Specific Objectives:

1. To develop an understanding of the increasing importance of the oceans in supplying the world with raw materials for industrial, agricultural, and domestic use

2. To develop an understanding that it is increasingly important to safeguard the use of this vast natural resource in the years to come

3. To develop an understanding of the basic knowledge and facts related to the use of the oceans to establish the necessity for conservation and proper resource use

4. To develop an understanding of why man must learn to live beneath the sea in his effort to properly explore and exploit the ocean and its many resources

5. To develop an understanding of the complex interrelationship of the life beneath the sea and the dependence of man upon this relationship

6. To develop an understanding that the future of our resources depends upon our activities today

IV. Introduction of the Topic

A. Questions related to what the students already know about the topic:

1. Why is our planet called "Earth" if three-fourths of its surface is covered with water?

2. What does Earth have that no other planet has in such a quantity?

3. Would the presence or absence of water affect the existence of life as we know it on other planets?

4. How deep can man descend and live beneath the surface of the ocean?

5. What equipment must he use?

6. What does man obtain from the sea?

7. What is on the ocean floor?

8. How deep are the oceans?

9. What plants and animals live in the sea?

10. How can we prolong the use of the sea as a source of food and raw materials?

B. Thought-provoking questions on the part of the teacher

1. How much water is in the sea?
Answer: 330 million cubic miles

2. What elements can we find in great quantity in the sea?
Answer: In a single cubic mile there are:

Oxygen	4,037,000,000 Ton	Strontium	37,700 Ton
Hydrogen	509,000,000 Ton	Boron	22,600 Ton
Chlorine	89,000,000 Ton	Silicon	14,130 Ton
Sodium	49,500,000 Ton	Fluorine	6,125 Ton
Magnesium	6,125,000 Ton	Argon	2,825 Ton
Sulphur	4,240,000 Ton	Nitrogen	2,350 Ton
Calcium	1,880,000 Ton	Lithium	940 Ton
Potassium	1,790,000 Ton	Rubidium	565 Ton
Bromine	306,000 Ton	Phosphorus	330 Ton
Carbon	132,000 Ton	Iodine	235 Ton

3. What are the 12 most important animal groups in the sea?

a. One-celled Animals - Protozoa
b. Sponges - Porifera
c. Flatworms - Platyhelmenthes
d. Round worms - Nematoda
e. Segmented worms - Annelida
f. Sea Anemones, Corals and Jellyfish - Coelenterata
g. Starfish and Sea Urchins - Echinodermata
h. Crabs, Shrimps and Barnacles - Arthropoda
i. Lamp Shells - Brachiopoda
j. Moss Animals - Bryozoa
k. Clams, Oysters and Octopi - Mollusca
l. Fish and Aquatic Mammals - Chordata

4. How is it possible for men to live under the sea?

5. Under pressures of the sea, can men breathe normal air or must they have special mixtures? Why?

6. What scientific principles or laws are involved in diving?

7. Where does most ocean life occur?
Answer: a. In the tidal zone, where land and sea meet
b. In the shallow seas off the continents down to approximately 500 feet

8. What is the basic "food" of sea life?
Answer: Plankton--meaning "that which is made to wander"; six-tenths of which are single-celled algae called diatoms

9. Why is man becoming more and more dependent upon the sea? Could conservation and wise resource use of the land have helped to alleviate this?

V. Body of Unit

A. Procedures and Activities

1. Plan and prepare an attractive bulletin board to introduce unit

2. Prepare display of marine life, corals, shells, or products commercially sold that originated in the sea

3. Secure some of the mentioned films or filmstrips to compliment unit and arouse class interest

4. Write to State and National Conservation Organizations for films, charts, materials and information that would be of help to you

5. Ask students questions about the things they see and provide additional information to them

6. Take students on field trips to nearby aquariums, hatcheries, canning and processing plants

7. Let students select an area of their own to investigate and let them present a short oral or written report on what they have learned

8. Try and interest students in writing (on their own) to individuals or corporations who can provide them with specific information or materials to supplement what you as a teacher have acquired and can offer

9. Have students evaluate what they have learned and correlate this to proper conservation and resource use practices

10. Lectures: The National Science Foundation supports a lecture series through The Texas Academy of Science. Contact Dr. Dale F. Leipper, Texas A&M University, College Station

B. Content

1. Basic information concerning the oceans

   a. geography
   b. size
   c. contents
   d. uses

2. Develop the concept of an "inner space" or "Hydrospace" that needs to be explored and exploited by research and investigation along with our efforts in outer space

   a. Much of our natural resources will come from the sea long before we are able to utilize materials from outer space

b. Some of these resources are now in commercial use; they are food products and minerals such as magnesium, bromine (for gasoline), sodium and chlorine, oil and natural gas. Future developments will include fresh water, manganese, and other rare elements

3. Life in the sea

a. Ocean life is used by man for food, raw materials, fertilizer and other uses
b. How can the use of this living raw material be prolonged?
c. Ocean life could be a source of food and nutrient material for many of the world's hungry and starving people

d. The increasing world population explosion makes the development of a source of cheap food mandatory

4. Men who have studied ocean depths

a. Hannes Keller
b. Jacques-Yves Costeau
c. Edwin Link of Link Foundation
d. Captain William Bond
e. William Beebe
f. Jacques Piccard

5. Machines that go deep under the sea

a. submarines
b. bathyscope (Beebe)
c. Trieste (Piccard--U.S. Navy)
d. Aluminaut--Reynolds Metals Company
e. Alvin--Litton Industries
f. Deepstar--Westinghouse Electric Corporation
g. Sea Pup
h. Turtle--Lockheed Missiles and Space Company
i. Beaver--Autonetics
j. Denise--Jacques Yves Costeau
k. Flip Ship--U. S. Navy

6. Current projects underway

a. Project Genesis, Capt. Bond, U. S. Navy
b. Project Sea Lab, Capt. Bond, U. S. Navy
c. Ed Link's Project
d. Jacques Costeau's Project
e. Hannes Keller's Deep Descent

7. Uses of the oceans

a. transportation
b. food
c. raw materials
d. weather forecasting

2 OF 2
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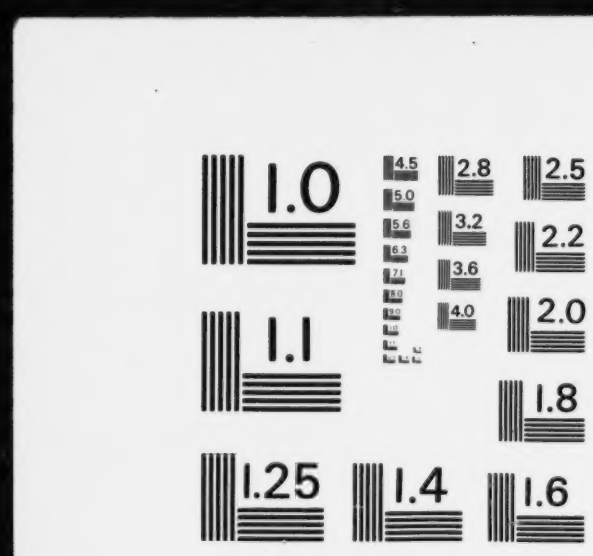

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

D. Continuity through the grades

This unit can be used in Biology, Earth Science, Geology, Physics, and Oceanography. Students should have been introduced to the study of the oceans in the elementary grades and in earth or general science in the junior high school

VI. Evaluative Procedures

A. Pupils

1. Writing to obtain information from individuals or corporations

2. Oral and/or written reports

3. Discussions

4. Oral and/or written tests

5. Composition on a topic of interest

B. Teacher

1. Did you accomplish what you intended?

2. Did you use the materials you intended?

3. Were the students interested?

4. Did the students learn things that will be of benefit to them and their country?

VII. Bibliography

Pamphlets, charts and information may be obtained from:

The Bureau of Commercial Fisheries, Fish and Wildlife Service, U. S. Department of the Interior, Washington

Texas Parks and Wildlife Department, Austin

The Department of Oceanography of the following colleges and universities would be excellent sources of local information:

U. S. Department of Agriculture Graduate School, Washington
Texas A&M University, College Station
University of Alaska, College, Alaska
The American University, Washington 16
Nerckhoff Marine Laboratory, California
Institute of Technology, Pasadena, California
The University of Chicago, Chicago 37, Illinois
The University of Connecticut, Starrs, Connecticut
Columbia University, New York 27, New York

2

Cornell University, Ithaca, New York
University of Delaware, Newark, Delaware
Duke University, Durham, North Carolina
Florida State University, Tallahassee, Florida
The University of Georgia, Athens, Georgia
Harvard University, Cambridge, Massachusetts
University of Hawaii, Honolulu 14, Hawaii
Humbolt State College, Arcata, California
John Hopkins University, Baltimore 18, Maryland
Gulf Coast Research Lab, Oceans Springs, Mississippi
Massachusetts Institute of Technology, Cambridge 39, Massachusetts
University of Miami, Coral Gables 46, Florida
University of Michigan, Ann Arbor, Michigan
New York University, New York 3, New York
Oregon State University, Corvallis, Oregon
University of the Pacific, Stockton 4, California
Pomona College, Claremont, California
University of Rhode Island, Kingston, Rhode Island
San Diego State College, San Diego, California
Scripps Institution of Oceanography, La Jolla, California
The University of Southern California, Los Angeles, California
Stanford University, Stanford, California
University of Texas, Austin
Walla Walla College, College Place, Washington
University of Washington, Seattle 5, Washington
College of William and Mary, Williamsburg, Virginia
University of Wisconsin, Madison 6, Wisconsin
Yale University, New Haven 11, Connecticut

Books

The Sun, The Sea and Tomorrow by Smith and Chapin, Scribner, New York

Ocean Harvest by Vogeland Caruso, Knopf, New York

Marine Products of Commerce by Tressler and Lemon, Reinholt, New York

Seaweed and Their Uses by V. J. Chapman, Pitman, New York

"Sulphur Under the Sea," Sea Frontiers, The Inter-National Oceanographic Foundation, 1 Rickenbacker Causeway, Virginia Key, Miami 49, Florida

The Sea, Life Nature Library, Time Incorporated, New York

The Fishes, Life Nature Library, Time Incorporated, New York

"The Sea," Life Magazine, Vol. 53, No. 25, December 21, 1962

"Chemistry and the Oceans," Chemical and Engineering News, June 1, 1964, Subscription Service Dept., American Chemical Society, 1155 16th Street, N.W., Washington

The Silent World, Jacques-Yves Cousteau with Frederio Dumas, Harper and Bros., 1953

The Living Sea, Jacques-Yves Cousteau with James Dugan, Harper and Row, Inc., 49 East 33rd St., New York 16, New York, 1963

The Voyage of the Beagle, Charles Darwin, E. P. Dutton

Man Under the Sea, James Dugan, Harper and Bros., 1956

Earth, Sky and Sea, Augusto Piccard, Oxford University Press, 1956

Seven Miles Down, Jaques Piccard and Robert Diety, Putnams Sons, 200 Madison Avenue, New York 16, New York, 1962

Oceanography and Marine Biology, H. Barnes, Macmillan, 1959

A Hole in the Bottom of the Sea, Willard Bascom, Doubleday, 1961

The Ocean Floor, Hans and Peterson, Yale University Press, 1954

The Earth Beneath the Sea, Francis P. Shepard, John Hopkins Press, 1959

The Living Tide, N. J. Berrill, Dodd, Mead, 1959

1001 Questions Answered about the Sea Shore, N. J. Berrill and Jacquelyn Berrill, Dodd, Mead, 1959

The Edge of the Sea, Rachel L. Carson, Houghton-Mifflin, 1955

The Sea Around Us, Rachel L. Carson, Oxford University Press, 1961

Life of the Shore and Shallow Sea, D. P. Wilson, Nicholson and Watson, London, 1951

Seashores, Herbert S. Zim and Lester Ingle, Golden Press, 1955

The Forest and the Sea, Marston Bates, Random House, 1960

A Biography of the Sea, Richard Carrington, Basic Books

Mermaids and Mastodona, Richard Carrington, Rinehart, 1957

Frontiers of the Sea, Robert Cowen, Doubleday, 1960

Dangerous Marine Animals, George MacGinitie, McGraw-Hill, 1949

Aspects of Deep Sea Biology, N. B. Marshall, Hutchinson, London, 1954

The Underwater Guide to Marine Life, Carleton Ray and Elgin Ciampi, H. S. Barnes, 1956

La Mer, Romanovsky, Francis-Boeuf and Bourcart, Librairie Larousse, Paris, 1953

The Seas: Our Knowledge of Life in the Sea and How It is Gained, Russell and Younge, Frederick Warner, Longon, 1928

The Oceans: Their Physics, Chemistry and General Biology, Prentice-Hall, 1942

Turn to the Sea, Sthelstan Spilhaus, National Academy of Sciences, National Research Council, Washington, D.C., 1959

Living Resources of the Sea, Lionel A. Walford, The Ronald Press, 1958

The New Science of Skin and Scuba Diving by the Conference for National Cooperation in Aquatics, Association Press, 291 Broadway, New York City

"Sea Lab I," and "U. S. Navy Aquanauts," Bill Barada, Skin Diver Magazine, Lynwood, California, June-August, 1964

Half Mile Down, William Beebe, Harcourt, Brace, 1934

Under the Sea, Maurice Burton, Franklin Watts, 1960

We Come from the Sea, Hans Hass, Doubleday, 1959

The Undersea Challenge, (Report of Proceedings of Second World Congress of Underwater Activities of the Confederation Mondiale des Activities Subaquatiques), British Sub-Aqua Club, 179 Sheen Court, Richmond, Surrey, England

Films:

"Man Looks to the Sea," Stanton Waterman, 16 Hunter Road, Princeton, New Jersey

"Restless Sea," 16 mm, color and sound by Walt Disney Studios available from your local Bell Telephone Company

"Blue Continent," 16 mm, color and sound; 41 min; Ideal Films, 2221 South Olive Street, Los Angeles 7, California

"Silent World," Academy Award, 16 mm, color and sound, 1 hour, 40 min; Ideal Pictures, Inc., 2434 South Harwood, Dallas 15, Texas or 2221 South Olive Street, Los Angeles 7, California

"Territory Underwater," 1 hour, 47 min; color and sound, AMF. Voit. Co., 2945 East 12th Street, Los Angeles 23, California

"Deep Frontier," 35 mm. filmstrip, color and sound, from U. S. Dept. of Interior, Bureau of Commercial Fisheries, Washington

The following list of films can be obtained on loan free of charge by writing to The Director, The Marine Laboratory, University of

Miami, No. 1 Rickenbacker Causeway, Miami 49, Florida

"Sea Foods and Customs" *
"Minerals From the Sea" *
"The Chain of Life in the Sea" *
"Invisible Seafood" *
"The Gulf Stream" *
"The Management of Fisheries" *
"The Shrimp" *
"Marine Borers" *
"Marine Corrosion" *
"Teamwork on Tuna" **
"And Now the Sea" **

* means 16 mm, sound, B & W, 15 min.
** means 16 mm, sound, color, 35 min.

The following is a list of amateur films that were presented at the Sixth and Seventh International Underwater Film Festival. It is possible that information could be obtained concerning these films by writing to this address: 5959 Hollywood Blvd., Hollywood, California, 90028

"The Timed Octopus," Dimitri Rebikoff
"The Care and Training of Mermaids," Burton McNeely
"Shark Hunter," Del Cantado
"The Diving Tenants of Tahiti," Dewey Bergman
"Water World," Stanton Waterman
"Quest of the Pacific Sunfish," Fred Roberts
"Experiment in Depth," (The Hannes Keller Deep Dive Film)
"Pescatorial Anestheseologist," W. G. Bumpy Bell
"Mysteries of the Gulf," Ron Church
"A Slurp Gun in Bimini," Don and George Brauer
"Diving into History," Sidney Wignall
"The Divided Sea," Tony Mann
"The Dueling Reef," Del Cantado
"Splendor in the Depths," Ron Church
"Octopus," Bill Barada
"Night Dive" W. G. Bumpy Bell
"Cape Ann Shores," Glen Kreitzer
"The Creatures of Never-Never Land," Tinker Bell
"Beneath the Sun's Rays," Ramon Bravo
"The Monster of El Capitan," Forrest Adrian (Shell Oil Co.)
"The Sunken Fleet of Marshal Rommel," Dimitri Rebikoff
"Beneath the Georgian Bay," Jack McKenney (Canada)
"1300 Years in the Sea," Beorge Bass and Al Giddings (USA)
"Slide Galaxy," Robert Ewing, III, and Chuck Nicklin (USA)
"Search for the Threasher," Sam Raymond (USA)
"Andros Reef Expedition," Stanton Waterman (USA)
"Both Sides of Baja," Chuck Peterson (USA)
"Slide Galaxy," Ben Cropp (Australia) and William DeCourt (USA)
"Under Sea Hunt," Ramon Bravo (Mexico)

"Man vs. Shark," Ben Cropp (Australia)
"We Shall Live in the Sea," Jordan Klein (USA)
"Still Waters," Elgin Ciampi (USA)
"A Whale of a Tale," Chuck Nicklin and William DeCourt (USA)
"Devil's Hole Expedition Report," Jim Joutz (USA)
"Mountains in the Sea," Eizo Tanaha (Japan)
"Slide Galaxy" Ron Church and Chuck Peterson (USA)
"The Dry Divers," Mort Taggweiler (USA)
"Ford Commercial," Jordan Klein (USA)
"Free Ascent Research," Jordan Klein (USA)
"The Beckoning Sea," Al Giddings (USA)
"The Black Coral Story," Stanton Waterman (USA)
"Cuba Underwater," Urbano Rodriguez (Cuba-USA)
"Venomous Creatures of the Sea," Dr. Paul Saunders
and Paul Tzimoulis (USA)
"Slide Galaxy," Jordan Klein
"Calo San Lucas," Ron Church (USA)
"Point of Antiquity," Ramon Bravo (Mexico)
"Sclaing the Great Barrier Reef," Ben Cropp (Australia)

ED042640

An Instructional Unit

Water Uses And Problems

Junior High School Level

Correlate With Texas Geography

SE 009 766

Water Uses And Problems

I. Area of conservation involved: Water Conservation

II. Topic: Water Uses And Problems

III. Objectives

A. General objectives

1. To develop an understanding of what a natural resource is

2. To develop an understanding of man's dependence upon natural resources

3. To develop the understanding that some natural resources are renewable and some are not

4. To develop the understanding that conservation means the wise use of our natural resources

5. To develop the understanding that water resources are related to soil, forest, wildlife, and recreational resources

6. To develop the understanding that water is one of the basic resources of mankind

B. Specific objectives

1. To examine the nature and importance of water resources

2. To develop the understanding of the many problems of water use

3. To develop an understanding of the remedies for the problems of water use

4. To develop an understanding that the most serious misuse of water is that of pollution

5. To develop an understanding that the reckless depletion of ground water is increasing water shortages over large areas of Texas

6. To develop an understanding that water is a circulating resource

7. To develop an understanding that some areas have flooding problems

8. To develop an understanding of the function of the water districts, and of State and Federal agencies

9. To develop the ability to recognize good and bad water use practices

IV. Introduction

A. Motivation

1. Bulletin board and other displays

2. Arrange information center with books, pamphlets, bulletins, and magazines

B. Questions designed to find out what the student already knows about water uses and problems

1. What are some of the different uses of water?

2. What are some of the different sources of water?

3. What is water pollution? Natural? Man-made?

4. What are some requirements for household water?

5. How has the building of artificial lakes helped in the development of agriculture? Supply of water? Production of power? Recreation? Flood retardation?

6. Where does your town obtain its water?

C. Thought-provoking questions

1. Why is ground water important in Texas?

2. What does water conservation mean?

3. Why is the underground water table becoming lower in much of Texas?

4. Why is there no substitute for water?

5. How do industries use water?

6. Why is water for food production one of its most important uses?

7. How is water used for recreation purposes?

8. Why is flood control important?

9. Why are we short of water in many areas?

10. Why can we not depend upon ground water for more of our water needs?

11. How can you help prevent water pollution?

12. How much water is used daily by the town you live in?

V. Body of the unit

A. Procedure

1. Place eye-catching display of water use and problems of water on bulletin board and develop information center

2. Ask questions designed to find out what the students already know about water uses and problems

3. Present thought-provoking questions

4. Originate activity program

   a. Class discussion led by teacher
   b. Class discussion led by water conservationist from local water district, or by biologist, chemist, or hydrologist

5. Use audio-visual materials

6. Visit area where water is being used in some phase of agriculture or industry

7. Presentation of pupil reports

8. Evaluative procedure

B. Content

1. The hydrographic cycle in nature

   a. Evaporation
   b. Circulation
   c. Precipitation
   d. Run-off
   e. Soak-in
   f. Utilization

2. Distribution of precipitation over Texas

   a. Humid areas
   b. Subhumid areas
   c. Semiarid areas
   d. Arid areas

3. Droughts (define)

   a. Causes
   b. Effects

4. Categories of water resources

   a. Little waters---brooks, bogs, cascades, ponds, irrigation ditches

b. Intermediate waters--creeks, bayous, springs, swamps, marshes
c. Great waters--rivers, lakes, ship canals, bays, harbors, storage reservoirs

5. The uses for water

a. Public and private water supply
b. Industrial use

(1) Raw material
(2) Plant machinery cooling
(3) Waste disposal

c. Stock watering
d. Irrigation
e. Drainage and flood control
f. Generation of power, hydroelectric and steam
g. Hydraulic mining
h. Sewage disposal
i. Aquatic animal and fowl propagation
j. Recreation

(1) Fishing and hunting
(2) Boating, skating, camping
(3) Bathing

6. Problems of water use

a. Competitive demands for water in any given region
b. Elimination of water pollution
c. Provision of additional supplies of water for the increasing needs of the future
d. Flood reduction

7. Remedies for pollution control

a. Garbage and waste-disposal plants
b. Filtration plants and settling basins
c. Silt reduction through soil-erosion control and flood control
d. Extension of sewer systems to unsewered areas
e. Education of the public to cease personal and family habits of polluting public and private waters
f. New laws and regulations dealing with water uses
g. Elimination of pollution by oil field brines
h. Elimination of natural pollution

8. Future inadequacy of water

a. Use water for irrigation more efficiently

(1) Reduce over-irrigation of land

(2) Substitute tile for open ditches
(3) Line canals with cement to reduce leakage

Reforest land, restore grass cover, and construct ponds and reservoirs in order to reduce run-off and increase soak-in, and thereby raise the water table. NOTE: This needs further study. More water may be consumed by worthless water-loving plants and by evaporation than is gained by "soak-in"

9. Flood

a. Reforest watersheds
b. Construct storage reservoirs and retarding basins. NOTE: When a "flood-control" reservoir is built that reduces the large floods, the downstream channel generally deteriorates losing much of its former capacity and thereby restoring the flood hazard
c. Restore the lakes, swamps, and wetlands which have been drained
d. Carry out engineering works on river channels and floodways
e. Control building and bridge construction within flood areas
f. Reduce silt load through soil-erosion control

C. Activities

a. Field trips
b. Lecture by local water conservationist
c. Lecture by teacher
d. Pupil reports

VI. Evaluative Procedure

A. Paper and pencil tests--questions should be constructed so as to determine whether the general and specific objectives have been reached

B. Class discussion in which students are motivated to answer oral questions

C. Composition exercises with these suggested topics:

1. "What Conservation of Water Means to Me"

2. "Uses of Water in Texas"

3. "Water Problems"

4. "What Is Water Pollution? Natural? Man-made?"

5. "Water, Wildlife, and Forest"

6. "The Importance of Flood Control"

7. "Where Does Our Water Go?"

D. Physical check to see if available resource materials were adequately used:

1. Do you have materials that were not used?

2. What new materials do you need?

3. Did you try to obtain additional information?

VII. Bibliography

Books, bulletins, and pamphlets:

A Primer On Ground Water, United States Department Of The Interior, Washington, D.C., 1963

A Primer On Water, USDI, Geological Survey, 1960

Conservation Of National Resources by George T. Renner, John Wiley and Sons, New York, 1942

Conserving Natural Resources by Shirley W. Allen, McGraw-Hill Book Company, New York, 1955

How Can We Meet Our Water Needs?, Texas Education Agency, Austin, Texas, 1963

Multiple-Purpose Watershed Projects, United States Department of Agriculture, Washington, D.C., 1963

Our Natural Resources by P. E. McNall, Interstate Printers and Publishers, Danville, Illinois, 1964

Water, Texas Society of Professional Engineers, Nash Building, Austin, Texas, 1955

The publications below are available from the Texas Water Commission, Austin. At the present time there are insufficient copies to make a distribution to all schools. Copies will be furnished on request as long as they last

The 25th Biennial Report of the Texas Water Commission

The 26th Biennial Report of the Texas Water Commission

Circular No. 64-03, "Publications of the Texas Water Commission as of December 31, 1964"

Bulletin 6404, "Conservation Storage Reservoirs in Texas, Some Aspects and Chronology of Surface-Water Resources Development"

Bulletin 6403, "Fifty Years of Water Development in Texas"

Bulletin 6408, "Dams and Reservoirs in Texas - Historical and Descriptive Information"

Circular 63-03, "The Development of the Science of Hydrology"

"A Plan for Meeting the 1980 Water Requirements of Texas"

Additional sources of information which may be used in teaching this unit

Books, bulletins, and pamphlets

Clean Water--A Challenge To The Nation, United States Department of Health, Education, and Welfare, Washington, D.C., 1961

Rural Recreation, United States Department of Agriculture, Washington, D.C. (Bulletin No. 930-1963)

Soil Erosion, United States Department of Agriculture, Soil Conservation Service, Washington, D.C. (Bulletin No. 260-1962)

Stop Your Floods Before They Start, Caterpillar Tractor Company, Peoria, Illinois

The National Water Resources Data Network, United States Department of The Interior, Washington

Water For Farm And City, United States Department of Agriculture, Washington, D.C., 1960

Water For Texas, A&M University of Texas, College Station, Texas, 1955

Water In Industry, National Association of Manufactures, New York

Water, Land, and People by Bernard Frank and Anthony Netboy, Alfred A. Knopf, New York, 1950

Water Resources Investigation In Texas, United States Geological Survey, 807 Brazos Street, Austin, Texas, 1962

Wonder of Water, Soil Conservation Society of America, Des Moines, Iowa

Films and Filmstrips

George Washington's River, 28 minutes, color, sound, United States Public Health Service, Washington

Muddy Waters, 19 minutes, black and white, sound, United States Department of Agriculture, Washington

The Living Water Series, 33 minutes, color, sound, Encyclopedia Britannica Films, Dallas

Water For A Nation 19 minutes, color, sound, United States Department of Agriculture, Washington

Water For The West, 25 minutes, color, sound, Soil Conservation Service State Office, Austin

Water-Let's Keep It Clean, 20 minutes, color, sound, Soil Conservation Service State Office, Austin

Water Resources, 31 frames, black and white, Curriculum Material Corporation, Philadelphia, Pennsylvania

AN INSTRUCTIONAL UNIT

SOIL USES AND PROBLEMS IN AGRICULTURE

Junior High School Level

Correlate With Science

SE 009 766

I. Area of conservation involved: Soil Conservation

II. Topic: Soil Uses and Problems in Agriculture

III. Objectives

A. General Objectives:

1. To develop an understanding of what a resource is

2. To develop an understanding of man's dependence upon resources

3. To develop the understanding that some resources are renewable and some are not

4. To develop the understanding that conservation means the wise use of our natural resources

5. To develop the understanding that conservation brings more resources to more people over a longer period of time

6. To develop the understanding that conservation practices require that man must live in harmony with nature

7. To develop the attitude that conservation is a way of life

B. Specific Objectives:

1. To develop the understanding of soil and its importance to man

2. To develop the understanding of the extent of damage done to our soil resources annually

3. To learn what remedies are needed to deal with the problem of soil loss

4. To learn that soil and water together produce most of man's livelihood

5. To develop the understanding that soil is a major source of wealth

6. To develop the understanding that soil can be conserved

7. To learn the important relationships between the conservation of soil and the conservation of water

8. To develop the understanding of major land uses

9. To develop an understanding of organizations contributing to soil conservation

10. To develop an understanding of the different kinds of soil

11. To develop an understanding of the importance of soil and water to the economy of Texas

IV. Introduction

A. Introduction of Terms:

Soil	Conservation
Loam	Dust
Clay	Grass
Sunlight	Grow
Save	Erosion
Roots	Sedimentation
Sand	Water
Plant	Runoff
Gully	Insoak
Cover	Capacity
Crop	Velocity
Natural	Watershed

B. Motivation:

1. Bulletin board and other displays

2. Arrange information center with books, bulletins, magazines, and pamphlets

C. Questions designed to find out what the student already knows about soil:

1. What is soil?

2. How is soil formed?

3. What are some of the different kinds of soil?

4. Why is soil erosion a critical problem?

5. How much do we depend on the soil?

6. What are some uses of soil?

7. What does soil have to do with our water supply?

D. Thought provoking Questions:

1. How does soil erosion take place?

2. Why is soil of equal importance to urban and rural people?

3. What effect does soil have on the State economy?

4. What are some problems of soil use?

5. What can be done to improve soil conditions?

6. How can you help to prevent soil erosion?

7. What are some problems in determining soil utilization?

8. Why should a farmer always make use of crop residue instead of burning it?

9. How can more water be held on the land for plant growth?

10. In what ways may a farmer get rid of excess water on farmland?

V. Body of the Unit

A. Procedure:

1. Place eye-catching display on bulletin board concerning soils and develop an information center

2. Ask questions designed to find out what the students know about soil

3. Present the thought-provoking questions

4. Originate activity program

a. Class discussion led by teacher
b. Class discussion led by soil conservationist

5. Use Audio-visual materials

6. Visit area to see uses and misuses of soil and to see the different types of soils

7. Visit dams or lakes which are sources of water supplies to see siltation

8. Presentation of pupil reports

9. Evaluative procedures

B. Content:

1. Soil is the primary source of many things
   a. Food
   b. Textiles
   c. Other raw materials

2. General grouping of soils
   a. Sand
   b. Silt
   c. Clay

3. What the Soil Conservation District does
   a. Plans for overall need of local area by developing a program and plan of work
   b. Utilizes technical assistance of Soil Conservation Service in planning and applying soil and water conservation measures on individual farms
   c. Utilizes financial assistance of ASCS
   d. Utilizes educational facilities of public schools and the Extension Service

4. State economy
   a. Development of industry
   b. Land values
   c. Farm income
   d. Ranch income
   e. Recreational facilities income
   f. Other

5. Soil use
   a. Cropland
   b. Pasture and range
   c. Forest and woodland
   d. Other uses

6. Natural processes in soil building
   a. Parent materials, kinds of rocks
   b. Weathering and additions of organic matter, effects of different climates
   c. Transportation and deposition by wind, water, and glaciers
   d. Time - 5,000 to 10,000 years to form or replace one foot of soil
   e. Vertical profile-topsoil, subsoil and bedrock
   f. Humus and mineral plant food

7. Problems of land use
   a. Problems in cultivating the soil
   b. Exhaustion of fertility and organic content
   c. Erosion
      (1) Gullying
      (2) Sheet washing
      (3) Blowing
   d. Problems in determining land utilization
      (1) Which land is to be settled and which left unsettled
      (2) Choice of land use on the individual farm
      (3) Uses of the public domain

8. Remedial land uses
   a. For the drier part of the state
      (1) Reseeding of grass
      (2) Changing from cropland to grassland use
   b. Exhaustion of soil
      (1) Elimination of repeated plantings of a crop on the same land
      (2) Development of diversified farming
      (3) Application of animal manures and the use of stubble and green manure crops
      (4) Increase planting of legume crops for nitrate building in the soil
      (5) Increased use of artificial fertilizer

   c. Erosion control
      (1) Classification of land according to slope
      (2) Adjustment of land utilization to slope
      (3) Maintenance of constant vigilance toward gullies
      (4) Leaving unplowed strips of grasses in low places
      (5) Building of erosion check dams
      (6) Use of terraces and contour cultivation
      (7) Elimination of pasture overgrazing
      (8) Careful management of crop residues in wind erosion areas
   d. Land utilization
      (1) Classification of land as to best use
      (2) Determination of the total commodity needs of the nation
      (3) Removal of economically submarginal land from cultivation
      (4) Reclamation of good land through irrigation and drainage
   e. Activities:
      (1) Field trips
         (a) To see different kinds of soil
         (b) To see examples of erosion
         (c) To see examples of good land use
         (d) To see examples of protected watersheds
      (2) Demonstrations
         (a) Difference in soils' ability to hold water

Cut the ends out of three tin cans of the same size; tie an old silk stocking over one end and fill each can about half full. Fill one can with a clay soil, one with a sandy soil and the third with a good garden soil. Put two pencils under each can so they are balanced over a tin plate; pour the same amount of water through each. Notice which soil holds the most water and which soil holds the least amount of water

(b) Effect of cover on the erosion of soil
Obtain two wooden boxes about one foot square and three or four inches deep. In one box place only soil. In the other box place soil that has grass growing on it (sod). Fix both boxes so that when tilted water running to one end will funnel out in one place. Tilt both boxes and sprinkle water in the boxes. Catch water running off in two fruit jars. Observe that water running off the bare soil is quite muddy while water from the soil with grass on it is almsot clear. Tilt the box with bare soil at different angles and sprinkle to show that the steeper the slope the more soil (and water) is lost

(c) How soil is held and used by roots
Dig up a piece of sod six inches square and weigh it. Then wash all the soil off the roots and weigh again. Observe how much soil was held by the roots. Get a chunk or slice of soil from a road cut or ditch where grass or other crops are growing. Examine closely to find how deep the roots go in the soil

(3) Lecture by soil conservationist

(4) Lecture by teacher

(5) Pupil reports

VI. Evaluative procedure

A. Paper and pencil tests - questions should be constructed so as to determine whether the general and specific objectives have been reached

B. Class discussion in which students are motivated to answer oral questions

C. Composition exercise with these suggested topics:

1. "What Does Conservation of Soil Mean To Me?"

2. "Uses of Soil"

3. "Soil Erosion"

4. "Public Water Supply and Erosion"

5. "The Formation of Soil"

6. "Is Man Dependent Upon The Soil?"

7. "Why Use Land According to its Capabilities?"

8. "The Purpose of Constructing a Terrace"

D. Physical check to see if available resource materials were adequately used:

1. Do you have materials that were not used?

2. What materials do you need as replacements or additionals?

3. Did you try to obtain additional information?

VII. Bibliography

A. Books, bulletins, and pamphlets:

1. Conservation Of National Resources by George T. Renner, John Wiley and Sons, New York, 1942

2. Elements of Soil Conservation by Hugh Hammond Bennett, McGraw-Hill Book Company, New York, 1955

3. Soil Conservation Workbook, The Interstate Printers and Publishers, Danville, Illinois

4. Agricultural Land Resources, United States Department of Agriculture, Washington, D.C. (Bulletin No. 263)

5. What The Soil Conservation Service Does, United States Department of Agriculture, Washington

6. Soil Conservation Districts, United States Department of Agriculture, Washington, D.C., 1960

Additional sources of information which may be used in teaching this unit:

A. Books, Bulletins and Pamphlets:

1. Conquest of the Land Through 7,000 Years, United States Department of Agriculture, Soil Conservation Service, Washington, D.C. (Bulletin No. 99)

2. How To Control A Gully by C. J. Francis, United States Department of Agriculture, Washington

3. It's Your Top Soil, American Steel and Wire Division, Cleveland, Ohio

4. Know Your Soil, United States Department of Agriculture, Washington, D.C. (Bulletin No. 267)

5. Life and Death of the Soil, Science Research Associates, Chicago, Illinois

6. Our Land and Its Care, National Plant Food Institute, Washington

7. Principals of Contour Farming, J. I. Case Company, Racine, Wisconsin

8. Soil Conservation, Deere and Company, Moline, Illinois

9. Soil Conservation At Home, United States Department of Agriculture, Soil Conservation Service, Washington, D.C. (Bulletin No. 244)

10. Soil Erosion: The Work Of Uncontrolled Water by J. G. Steele, United States Department of Agriculture, Washington

11. The Measure of Our Land, United States Department of Agriculture, Washington, D.C., 1951

12. The Soil That Went to Town, United States Department of Agriculture, Washington, D.C. (Bulletin No. 95)

13. The Story of Land, Soil Conservation Society of America, Des Moines, Iowa

14. The Story of Soil by Roy L. Donahue and M. K. Thornton, Texas A&M University, College Station, Texas

15. The Why, What and How of Soil Conservation Districts, National Association of Soil Conservation Districts, League City, Texas

16. This Is Our Soil by E. D. Walker and A. B. Foster, The Interstate Printers and Publishers, Danville, Illinois

17. Rain or Shine, by Baer, New York: Farrar Rinehart

18. The Wonders of Water, Baer, New York: Farrar Rinehart

19. River Book, Beaty, Chicago: Beckly-Cardy

20. Not Only For Ducks, Blough, New York: McGraw-Hill

21. Water Appears and Disappears, Blough and Parker. Evanston: Row-Peterson

22. Water Is Wonderful, Curtis. Chicago: Lyons and Carnahan

23. Rich Land, Poor Land, Chase and Sturt. New York: McGraw-Hill

24. Adventuring in Science, Gerald S. Craig and Katherine E. Hill. Boston: Ginn and Company

25. Soil, Water, and Man, Deusing. Evanston: Row-Peterson

26. Oceans in the Sky, Edelstadt. New York: Alfred Knopf

27. Picture Book of the Earth, Jerome Meyer. New York: Lathrop

28. Water, Parker. Evanston: Row-Peterson

29. Clouds, Rain and Snow, Parker. Evanston: Row-Peterson

30. Rocks, Rivers, and the Changing Earth, Herman and Nina Schneider. New York: W. R. Scott

31. First Book of Conservation, Smith. New York: Franklin Watts

32. The Yearbook of Agriculture: 1955, Water, United States Department of Agriculture, Government Printing Office, Washington

33. Water, Water, Everywhere, Mary Wash. Nashville, Tennessee: Abringdon-Cokesbury

34. Soil Means Life, Fair C. Griffin, National Wildlife Federation, 1412 16th Street, N. W. Washington

35. Soil Conservation, Frank B. Harper (ed.), Government Printing Office, Washington

36. Native Lands. New York: National Association of Manufacturers, Educational Aids, 2 East 48th Street

B. Films and Filmstrips:

1. Birth Of The Soil, 11 minutes, color, sound, Encyclopedia Britannica Films, Wilmette, Illinois

2. Erosion, 11 minutes, black and white, sound, United States Department of Agriculture, Washington

3. From The Ground Up, 14 minutes, color, sound, United States Department of Agriculture, Washington

4. Keep Your Eye On The Soil, 18 minutes, black and white, Deere and Company, Moline, Illinois

5. Land Use, 54 frames, color, Colonial Films, Atlanta, Georgia

6. Raindrops and Soil Erosion, 21 minutes, color, sound, United States Department of Agriculture, Washington

7. Saving the Soil, 55 frames, color, Popular Science Films, New York, New York

8. Soil Conservation, 41 frames, black and white, American Council on Education, Washington

9. Soil Resources, 32 frames, color, Curriculum Films, New York, New York

10. This Is Our Land, 28 minutes, black and white, sound, Ethyl Corporation, New York, New York

11. What Is Soil, 47 frames, black and white, Encyclopedia Britannica Films, Wilmette, Illinois

12. Arteries of Life, Encyclopedia Britannica

13. Water for Dry Land, United World Films, 1445 Park Avenue, New York 29, New York

ED042640

AN INSTRUCTIONAL UNIT

THE IMPORTANCE OF SOIL CONSERVATION TO THE PEOPLE OF TEXAS

Senior High School Level

Correlate With Social Studies (Government,

Economics, Texas History, Sociology)

SE 009 766

I. Area of Conservation: Soil (some application to water)

II. The Importance of Soil Conservation To The People of Texas

III. Objectives

A. General Objectives:

1. To understand that conservation is the wise use, development, and improvement of natural resources

2. To understand that conservation is accomplished by people and for the benefit of people

3. To understand that conservation of resources is the only way of meeting the needs of our expanding population and national and world emergencies

B. Specific Objectives:

1. To understand that soil and water can be used and improved by people

2. To understand that people who own and operate land have responsibilities for its conservation

3. To understand that people in our towns and cities are dependent upon the land and must be actively concerned about conservation

4. To understand the Federal government's responsibility in conservation

5. To understand the State government's responsibility in conservation

6. To understand the local government's responsibility in conservation

7. To understand the structure and functions of Soil Conservation Districts

IV. Introduction of Topic

A. Motivation

1. Information center and bulletin board pertaining to conservation

2. Use film

B. Thought questions

1. What is meant by a renewable natural resource?

2. What is the definition of conservation in relation to a renewable natural resource?

3. What part do people play in conservation of soil?

4. In what ways should the Federal government show its responsibility in conservation of soil?

5. In what ways should the State government show its responsbility in conservation of soil?

6. In what ways should local governments (County, municipal, soil conservation district) show its responsibility in conservation of soil?

7. What is a Soil Conservation District?

8. Who governs a Soil Conservation District?

9. What is the individual landowner's stake in conservation of Soil?

10. Why should every person be concerned about soil conservation?

C. Films

1. Show one or more of the films listed in the bibliography

D. Suggested Titles for Written or Oral Reports

1. "The Meaning of Conservation"

2. "Soil Conservation Districts - Democracy in Action"

3. "Soil Conservation - Everybody's Business"

4. "Soil Conservation - A Way of Life"

5. "Youth's Stake in Conservation"

6. "Conservation - Cornerstone of Our Economy"

7. "Conservation - Answer to Future Food Supply"

8. "Conservation - Our Best Insurance"

9. "Conservation and Government"

10. "Conservation and the Individual"

V. Body of the Unit

A. Procedure

1. Introduce vocabulary words

2. Display information center and bulletin board

3. Ask questions

4. Assign pupils to read from materials listed in bibliography and other material in library on subject

5. Class discussion led by teacher

6. Lecture or discussion led by resource person

7. Oral reports by students

8. Evaluation procedures

B. Content

1. Vocabulary words and phrases
   a. Renewable natural resources
   b. Conservation
   c. Soil Conservation District
   d. District Supervisor

2. History of conservation movement in Texas
   a. Experiment Stations to study erosion - Texas Congressman James Buchanan authored bill in national Congress - two Stations established in Texas
   b. Demonstration projects established in Texas - 9 from 1933 to 1937
   c. Soil Conservation Act passed by National Congress in 1935
   d. State Soil Conservation Law (House Bill 20) passed in 1939 - created State Soil Conservation Board and enabled local people to organize local Soil Conservation Districts
   e. Organization of Districts started in 1939
   f. Law was re-written in 1941 as House Bill 444, which is now in operation
   g. Over 99 per cent of area of Texas now in 183 Soil Conservation Districts

3. Levels of responsibility in conservation
   a. Individual landowner
   b. Local Soil Conservation District
   c. Other local governments
   d. State government
   e. Federal government
   f. All people

4. Reasons for organized effort
   a. Soil can be conserved - used - improved
   b. Important for preserving tax base
   c. Important for future use of people
   d. Important to produce raw materials for many purposes
   e. Important to preserve place to live
   f. Important to preservation of wildlife
   g. Important to developing places of recreation
   h. Important to prevent water pollution
   i. Important to prevent sedimentation of reservoirs
   j. Important to assist in preserving public health
   k. Important to help maintain municipal, industrial, and agricultural water supply
   l. Important to assist in landscape beautification
   m. Important for furnishing employment - 40 per cent of Nation's working force now employed in agricultural production, processing of products, distribution

C. Activities

1. Written or oral reports by students

2. Lecture by local soil conservation specialist

D. Continuity through the Grades

This unit is related to events in Texas History. It should be a part of the study of Government since Soil Conservation Districts are legal subdivisions of State government. Also various forms of assistance are furnished Soil Conservation Districts and individual landowners by State and Federal governments. It should be a part of the study of Economics since the continued production of agriculture products definitely affects our economy

VI. Evaluation Procedures

A. Class discussion in which pupils are motivated to answer oral questions

B. Written tests

1. Questions should be constructed so as to determine whether the general and specific objectives have been reached

VII. Bibliography

A. Bulletins and Pamphlets

1. Conquest of the Land Through 7,000 Years. Washington Soil Conservation Service, United States Department of Agriculture, 1953 (Obtain from local Soil Conservation Service official)

2. Texas State Soil Conservation Laws. (Obtain from local Soil Conservation District)

3. America's Conservation Districts. The National Association of Soil and Water Conservation, League City, Texas. $8.00 per 100 copies

4. Your Local Soil Conservation Districts Program and Plan of Work (Obtain from local Soil Conservation District)

5. Annual Reports of Your Local District (Obtain from local Soil Conservation District)

6. Newsletters of your Local District (Obtain from your local Soil Conservation District)

7. County Conservation Needs Report (Obtain from local Soil Conservation Service official)

8. Costs Returns Data (Otain from local Soil Conservation Service official)

B. Map of Soil Conservation Districts in Texas (Obtain from local Soil Conservation District)

C. Films

1. The Earth is the Lords - The National Association of Soil and Water Conservation Districts

2. Return to Eden - Allis-Chalmers Tractor Group

3. With Our Own Hands - Allis-Chalmers Tractor Group

4. Water Bill U.S.A. - Caterpillar Tractor Company

ED042640

An Instructional Unit

Relationship of Soil, Water, Range, and Wildlife

Junior High School Level

Correlate with Science (Earth Science)

SE 009 766

Relationship of Soil, Water, Range, and Wildlife

I. Area of Conservation Involved: Wildlife Conservation

II. Topic: Relationship of Soil, Water, Range, and Wildlife

III. Objectives

A. General Objectives

1. To develop an understanding that all living things are interrelated and interdependent

2. To develop an understanding that some natural resources are renewable and some are not

3. To develop an understanding that conservation means wise use of our resources

4. To develop an understanding that many conservation practices exemplify man living in harmony with nature

B. Specific Objectives

1. To develop an understanding of what is meant by the term wildlife

2. To develop an understanding of the simple facts about the most important species and their daily needs

3. To develop an understanding of the economic importance of wildlife

4. To develop an understanding of the factors which help maintain a proper balance of wildlife

5. To develop an understanding of the relationship between conservation of soil and water and wildlife

6. To develop the understanding that wildlife resources can be conserved by management practices

7. To develop an understanding that all wildlife species are interrelated and interdependent with all other living things in the environment

8. To develop an understanding that all wildlife must have ample food, cover, protection from enemies, and a place to raise its young

IV. Introduction

A. Motivation

1. Arrange a display, e.g., pictures from the State Parks and Wildlife Department

2. Arrange an information center

B. Questions designed to determine what students already know about wildlife conservation

1. What do we mean when we say "wildlife"?
2. What is a domesticated animal?
3. What are conservation officers?
4. Who establishes laws governing the harvesting of wildlife?
5. Who owns the wildlife in Texas?
6. How can wildlife best be conserved?
7. What are some methods to conserve wildlife?
8. What are the kinds of wildlife in your county?

C. Thought-provoking questions

1. How many different types of wildlife do you think inhabit Texas?
2. How is wildlife important to you?
3. Does your county have any special game laws?
4. Do you see game animals often?
5. How does wildlife assist in the balance of nature?
6. What does water have to do with the abundance of wildlife?
7. What does range and soil have to do with wildlife?
8. What does it mean when we say that the people own the wildlife?
9. Does the land owner have any special rights concerning the wildlife on his property?
10. Does the "Conservation Pledge", mean wildlife too?

D. Demonstrations

1. Let the children select one migratory animal of particular interest to them. Develop a project which depicts its habitat in summer and winter. Show its migratory route on a map of the Western Hemisphere
2. Divide the class into groups. Let the different groups make murals showing the way some of the animals live through all the seasons

V. Body of the Unit

A. Procedure

1. Place pictures from Parks and Wildlife Department on display

2. Have students use information center
3. Originate activity program
   a. Class discussion led by the teacher
   b. Class discussion led by a conservation officer (if possible)
4. Excursions to
   a. Game Refuge
   b. Fish Hatchery
5. Present questions designed to find out what pupils know about topic
6. Present thought-provoking questions
7. Initiate individual and group projects and demonstrations
8. Use audio-visual materials
9. Evaluate learning and the development of suitable attitudes

B. Content

1. Wildlife requirements
   a. Food
   b. Cover
   c. Water
2. Managing land to meet wildlife requirements
   a. Cropland practices helpful to wildlife
      (1) Cropping systems that include grass-legume meadows
      (2) Liming and fertilizing
      (3) Cover crops
      (4) Stubble-mulch tillage
      (5) Stripcropping
      (6) Delaying mowing headlands, roadsides, and water-courses until after the nesting season
      (7) Leaving borders unharvested
   b. Cropland practices harmful to wildlife
      (1) Clean fall plowing
      (2) Mowing of water courses and headlands before ground nesting birds have hatched
      (3) Burning of ditchbanks, fence rows, and crop residue
   c. Pastureland practices helpful to wildlife
      (1) Grazing within the carrying capacity of the pasture
      (2) Liming and fertilizing
      (3) Reseeding, renovating, or over-seeding with legumes
      (4) Building ponds for livestock water
   d. Pastureland practices harmful to wildlife
      (1) Uncontrolled burning
      (2) Overgrazing
      (3) Complete clean mowing early in the season
   e. Rangeland practices helpful to wildlife
      (1) Proper grazing and salting
      (2) Watering places for livestock

(3) Reseeding
(4) Construction of walkways in marshy range
(5) Partial brush removal

f. Rangeland practices harmful to wildlife
(1) Overgrazing
(2) Complete brush removal

g. Woodland practices helpful to wildlife
(1) Protection from wild fires and harmful grazing
(2) Selective cutting in small woodlands
(3) Leaving den trees when cutting hardwood timber
(4) Piling bursh near the edge of the woods
(5) "Release", cuttings to increase production of acorns, nuts, and other tree seeds useful to wildlife
(6) Cutting trees out of woodland borders to increase the growth of shrubs for food and cover
(7) Seeding clovers and grasses along roads and trails and in woodland openings

h. Woodland practices harmful to wildlife
(1) Uncontrolled burning and grazing
(2) Cutting of all den trees

3. Special land practices for wildlife
a. Controlled burning
b. Food-patch planting
c. Mowing or using herbicides
d. Seeding grasses and legumes
e. Planting trees and shrubs (especially in prairie areas)
f. Managing water
(1) Construction of earth fills
(2) Installation of water-level control structures
(3) Establishing wildlife watering places

4. Land treatment for wildlife
a. Wetlands
(1) A dependable water supply
(2) Water-level control facilities
(3) The right kinds and amount of vegetation for feeding, nesting, and resting

b. Ditchbanks
(1) Establish and keep grass on banks
(2) Plant a one-or-two row shrub windbreak
(3) Mowing and grazing late in summer
(4) Avoid burning

c. Odd areas (waste lands)
(1) Protect from fire and grazing
(2) Plant a cover crop
(3) Supply nesting and food for song birds
(4) Use lime and fertilizer where needed
(5) Add living fence with thorny shrub

d. Ponds
(1) Soil erosion and flood control
(2) Water storage and livestock
(3) Irrigation
(4) Orchard spraying

(5) Fire protection for farm buildings
(6) Drinking water for deer, wild turkeys, and other wildlife
(7) Resting, feeding, and breeding places for ducks
(8) Fish production

e. Fence rows and hedges
(1) Stone and stump fences
(2) Barbed and woven wire fences
(3) Living fences of close-growing herbs
(4) Shrubby fence rows

f. Wildlife border uses
(1) Control erosion
(2) To make use of narrow strips of land
(3) Two types of wildlife border
(a) Those made of grasses and legumes
(b) Those made up of shrubs and conifers

g. Windbreaks
(1) Helps control wind erosion
(2) Lessens the drying effect of wind on soil
(3) Conserves snow moisture
(4) Provides wildlife cover
(5) Creates homes for insect-eating birds
(6) Two-types of field windbreaks
(a) Shrub-hardwood
(b) Pine windbreaks

h. Streambanks
(1) Helps control bank cutting or erosion
(2) Protects valuable adjoining property
(3) Reduces the silt load in streams
(4) Usually provides food, cover, and water close together
(5) Improves the stream for fish
(6) Benefits fur-bearers, game birds, and mammals, and songbirds

5. Recreation is a product of conservation and includes
a. Fishing
b. Boating
c. Swimming
d. Waterskiing
e. Picnicking
f. Hunting
g. Nature study
h. Making travel pictures

6. Significant things to remember about
a. Wildlife can be conserved
b. Wildlife must depend upon the soil, water, and range for survival
c. Wildlife conservation is an individual responsbility
d. Wildlife conservation is the obligation of one generation to the next
e. Wildlife is important as a source of business
f. Wildlife is important for recreation

7. Study of the local wildlife conservation practices
   a. Effectiveness of local practices
   b. Needed improvements

C. Activities

1. Field trips
2. Laboratory experiences
   a. Range conservation - as plant
   b. Contour plowing - show in a box of dirt
   c. Build check dam in experiment box
3. Pupil reports
4. Group work on murals
   a. Game animals
   b. Fish
   c. Birds
5. Picture collection of game animals
6. Picture collection of game birds
7. Picture collection of fish

D. Continuity through the grades

This unit is related to the study of earth science. Earth science is taught in the elementary school. It is also taught in senior high school. Other units on wildlife conservation are available for the elementary grades as well as for the senior high school

VI. Evaluative Procedures

A. Paper and pencil test

Questions should be constructed so as to determine whether the general and specific objectives have been reached

B. Class discussion in which children are motivated to answer oral questions

C. Composition exercises with these suggested topics

1. "What Wildlife means to me"
2. "Local Wildlife Practices"
3. "Wildlife Belongs to the People"
4. "Growing Quail as a Crop"
5. "Relationship Between Soil, Water, Range, and Wildlife"
6. "Game Laws in Your County"
7. "The Duties of a Conservation Officer"
8. "A Visit to the Fish Hatchery"
9. "A Visit to a Game Refuge"

D. Check to see if available resource materials were adequately used
   1. Do you have materials that were not used?
   2. What additional materials do you need?

VII. Bibliography

A. Printed Materials

1. Anderson, Wallace L., Making Land Produce Useful Wildlife, Farmer's Bulletin, No. 2035, U.S.D.A., 1960

2. Anderson, Wallace L., Wildlife Through Soil and Water Conservation, U.S.D.A., No. 175

3. Blough, Glenn O. and Huggett, Albert J., Elementary School Science and How to Teach It, Dryden Press Inc., 1957 (book)

4. Blough, Glenn O. and Campbell, Marjorie H., Making and Using Classroom Science Materials in the Elementary School, The Dryden Press, 1954, (Book)

5. Carroll, T. D., Assay of Texas Game, from The Texas Game and Fish Commission, March 1960

6. Comstock, Anna Botsford, Handbook of Nature Study, Publishing Associates, 1939, (Book)

7. Cooper, Edwin H., Improve Your Fish Pond, Texas Agricultural Extension Service, No. 213

8. Craig, Gerald S., Science for the Elementary School Teacher, Ginn and Company, 1958, (Book)

9. Craig, Gerald S., Roche, Ruth Lippenberger, and Navarra, John Gavreil, Experimenting in Science, Ginn and Company, 1958, (Book)

10. Curtis, Mary L., Conservation in America, Lyons and Carnahan, 1947, (Book)

11. Davison, Verne E., Managing Farm Fields, Wetlands, and Waters for Wild Ducks in the South, U.S.D.A., No. 2146

12. Dowling, Thomas I., Freeman, Kanneth, Lacy, and Tippett James S., The New Understanding Why, Grade Six, The John Winston Company, 1957, (Book)

13. Garden Club of America, The World Around You, Conservation Committee, 598 Madison Avenue, New York

14. Griffin, Fair C., Soil Means Life, National Wildlife Federation, 1957, Washington

15. Hill, Wilhelmina, "The Three R's and Resources", National Wildlife Federation, Washington

16. Jackson, Alfred S., Holt, Clyde, and Lay, Daniel S., Bobwhite Quail in Texas, Information-Education Brochure No. 101

17. Lay, Daniel W., "Pines" Texas Game and Fish Commission, Austin, Texas, April 1958

18. Lay, Daniel W., Quail Management Handbook for East Texas, Bulletin No. 34, Texas Game and Fish Commission, Austin, Texas, 1954

19. Lynch, R. G., "Ditches, Dust, and Ducks", National Wildlife Federation, 232 Carroll Street, N. W., Washington

20. Nagel, Werner O., "Habitat Improvement", National Wildlife Federation, Washington

21. Texas Game and Fish Commission, "Kerr Wildlife Management Area", Austin (Bulletin)

22. Texas Game and Fish Commission, "Sheldon Wildlife Management Area, Austin (Bulletin)

23. The Department of Wildlife Management, "Wildlife Management, "Wildlife Management", A. & M. College of Texas, College Station. (Bulletin)

24. The National Wildlife Federation, Water, 1412, 16th Street, N. W., Washington

25. The National Wildlife Federation, By Which We Live, 1412 Sixteenth Street, N. W., Washington

26. The National Wildlife Federation, Count Down to Survival, (Ernest Swift), 1412 Sixteenth Street, Washington

27. The Texas Agricultural Extension Service, Improve Your Fish Pond, B-213

28. The Texas Board of Water Engineers, A Plan for Meeting the 1980 Water Requirements of Texas, Austin (1961)

29. U.S.D.A. Outdoor Recreation in Small Watershed Projects, Soil Conservation Service, PA-500

30. U.S.D.A. Managing Farm Fields, Wetlands, and Water for Wilds in the South, Farmers' Bulletin No. 2144

31. U.S.D.A., Recreation a Product of Conservation, Soil Conservation Service, Temple

32. U.S.D.A., List of Available Publications, List No. 11, Publications Division, Office of Information, U.S.D.A., Washington, D. C. (Pamphlet)

B. Visual Materials

1. Encyclopedia Britannica, "Animals in Spring", Film

2. Encyclopedia Britannica, "Animals in Summer", Film

3. Encyclopedia Britannica, "Annimals in Winter", Film

4. Encyclopedia Britannica, "Life in the Desert", Film

5. Encyclopedia Britannica, "Mammals are Interesting", Film

6. Encyclopedia Britannica, "Water Birds", Film

7. U.S.D.A., "Soil and Water Conservation by the Beaver", No. 502

8. U.S.D.A., "Soil Conservation Benefits Wildlife"

9. U.S.D.A., "Wildlife and Soil Conservation", No. 670

10. U.S.D.A., "Wildlife Management Through Soil Conservation in the Northwest", No. 562

ED042640

An Instructional Unit

PRINCIPAL BIG GAME MAMMALS OF TEXAS
(white-tailed deer, mule deer, prong-horned antelope and javelina)

SE 009 766

High School
Biology and Social Studies (Economics)

I. Area of conservation involved: Wildlife Conservation

II. Topic: A Study of the White-tailed Deer, Mule Deer, Prong-horned Antelope and Javelina

III. Objectives

A. General objectives:

1. To develop the understanding that all wildlife resources in Texas belong to all the people of Texas
2. To develop an understanding of the economic importance of wildlife to towns and landowners
3. To develop an appreciation for the sport and recreation values of wildlife
4. To develop an understanding that wildlife resources can be conserved by management practices
5. To develop an understanding of the factors which help maintain a proper balance of wildlife

B. Specific objectives:

1. To understand what wildlife is
2. To understand the organization and function of the Texas Parks and Wildlife Department
3. To understand the importance of soil conservation districts to wildlife
4. To understand the current laws and regulations concerning the pursuit, taking and use of wildlife
5. To understand the rights of landowners in wildlife conservation and harvest
6. To understand that conservation of wildlife does not mean that it cannot be hunted

7. To understand that wildlife conservation is an individual responsibility
8. To understand that wildlife must have ample food, cover, protection from enemies, and a place to raise its young
9. To develop an understanding of deer, antelope and javelina and their daily needs

IV. Introduction

A. Motivation:

1. Bulletin board and other displays
2. Arrange information center with pamphlets, magazines, bulletins and books

B. Questions designed to find out what the students know about deer, antelope and javelina:

1. Why is the mule deer so named?
2. How did the curiosity of the antelope nearly bring about its extinction?
3. What kind of habitat do deer, antelope and javelina like?
4. What are some of the enemies of deer, antelope and javelina?
5. How fast can the antelope run?
6. How and when did the javelina receive the status of "game" in Texas?
7. What are some differences between mule deer and white-tailed deer?
8. Is the prong-horned antelope a true antelope?
9. Can you tell the age of a buck deer by counting the "points" on its antlers?

C. Thought-provoking questions:

1. Where are deer, antelope and javelina located in Texas?
2. Why might farmers have a different opinion than ranchers about having these game animals on their land?
3. What economic value is derived from these big game species?
4. What are some requirements for the continued support of deer, antelope and javelina?
5. Why are closed seasons, reduced bag limits and game refuges only partially effective in maintaining these big game animals?
6. Who owns the wildlife of Texas?
7. Why should hunters practice good manners in the field?
8. Who makes laws concerning the regulation of hunting?
9. What livestock do deer, antelope and javelina compete with for food?
10. Why are landowners entitled to charge for hunting deer, antelope, and javelina?
11. What effect has range destruction had on deer, antelope and javelina?
12. Name the big game mammals of Texas other than deer, antelope and javelina

D. Additional sources of information which may be used in teaching this unit

1. Books, bulletins, and pamphlets:
   a. American Mammals; Their Lives, Habits and Economic Relations by W. J. Hamilton, McGraw-Hill Company, New York, 1939
   b. Audubon Nature Bulletins, National Audubon Society, New York

c. Basic Deer Management by William P. Dasmann, Department of Fish and Game, Sacramento, California, 1950

d. Deer (White-tailed and Mule Deer), Map, Texas Parks and and Wildlife Department, Austin

e. Digest of Game and Fish Laws - State of Texas, Texas Parks and Wildlife Department, Austin

f. Game Management by Aldo Leopold, Charles Schribner's and Sons, New York, 1932

g. Our Endangered Wildlife, National Wildlife Federation, Washington

h. Practice of Wildlife Conservation by Leonard Wing, John Wiley and Sons, 1951

i. Texas Wildlife and Conservation, Texas A and M Management Plant, College Station

j. The Farmer and Wildlife, Wildlife Management Institute, Washington

k. The Mule Deer in Arizona Chaparral by Wendell G. Swank, Arizona Game and Fish Commission, Phoenix, Arizona, (Bulletin No. 3-1958)

l. Tomorrow's Gun, Texas Parks and Wildlife Department, Austin

m. Wildlife Management, Texas A & M University, College Station

2. Films and filmstrips:

a. A Heritage We Guard, 30 minutes, black and white, Soil Conservation Service, Washington

b. Big Land Animals of North America, 11 minutes, color, sound Encyclopedia Britannica Films, Dallas

c. Conservation Today, Abundance Tomorrow, color 65 frames, Colonial Films, Atlanta, Georgia

d. Deer Live in Danger, 11 minutes, sound, color, Texas Parks and Wildlife Department, Austin

e. High and Wide, 14 minutes, black and white, Texas Parks and Wildlife Department, Austin

f. Land of Far Horizons, 14 minutes, sound, color, Texas Parks and Wildlife Department, Austin

g. Master Whitetail, 23 minutes, sound, color, Texas Parks and Wildlife Department, Austin

h. Problems of Wildlife Today, color, 58 frames, Society of Visual Education, Chicago, Illinois

i. Slides on Local Conditions, Local Game Warden, County Agent, or Soil Conservation Service

j. Wildlife Resources, 28 frames, Curriculum Films, New York

V. Body of the unit

A. Procedure:

1. Place eye catching display of javelina, deer and antelope on the bulletin board and develop information center

2. Ask questions designed to find out what the students know about the javelina, deer and antelope

3. Present the thought-provoking questions

4. Originate activity program

5. A. Class discussion led by teacher

B. Class discussion led by game warden or game biologist

6. Use audio-visual materials

7. Visit area that contain javelina, deer and antelope

8. Presentation of pupil reports

9. Evaluative procedure

B. Content:

1. History of mule deer, antelope, javelina and white-tailed deer

2. Distribution of mule deer, antelope, javelina and white-tailed deer in Texas

a. Mule deer -- Trans-Pecos and High Plains

b. Antelope -- Trans-Pecos and High Plains

d. Javelina -- South Texas Brushlands, Hill Country and Trans-Pecos

e. White-tailed deer -- nearly state-wide

3. Characteristics

a. Mule deer

(1) Size - average weight is between 125-225 pounds and average length of body is 71 inches

(2) Color - brownish gray coat in winter and yellowish brown in summer

(3) Antlers - forked main beams

b. White-tailed deer

(1) Size - average weight is between 70-200 pounds and average body length is 72 inches

(2) Color - reddish brown in summer, bright grayish in winter, tail and face usually lack blackish markings, under parts white

(3) Antlers - main beams not forked. Tines or point arising from main beams

c. Antelope

(1) Size - average weight is between 90-125 pounds and average length of body is 59 inches

(2) Color - white belly and rump while tan or buff over remainder of body

(3) Horns - pronged

d. Javelina

(1) Size - average weight is between 30-50 pounds and average length of body is 38 inches

(2) Color - pelage grizzled black and grayish with dark dorsal stripe. Distinct whitish collar across shoulders in adults. Young, reddish to yellowish brown, with dark stripe down back

(3) Feet - four toes on front feet, three on hind feet

4. Food

a. Mule deer

(1) Lechuguilla

(2) Sotol

(3) Mesquite

(4) Juniper

(5) Weeds

(6) Grasses

(7) Shrubs

b. White-tailed deer

(1) Weeds and grasses

(2) Mexican persimmon

(3) Live oak acorns and leaves

(4) Spanish oak leaves

(5) Spike rush

(6) Oats and other grain

(7) Turkey pear

c. Antelope

(1) Cutleaf daisy

(2) White daisy

(3) Stickleaf

(4) Paper flower

(5) Grasses

(6) Shrubs

(7) Forbs

d. Javelina

(1) Prickly pear

(2) Sotol

(3) Lechuguilla

(4) Mesquite beans

(5) Mast and fruits

(6) Terrestrial insects

5. Enemies

a. Deer - (mule deer and white-tailed deer)

(1) Timber wolf

(2) Cougar

(3) Coyote

(4) Bobcat

(5) Parasites

(6) Drouth

(7) Overgrazing of the land

(8) Fatal injury on the highways

(9) Fences

b. Antelope

(1) Cougar

(2) Coyotes

(3) Bobcat

(4) Golden eagle

(5) Drouth

(6) Overgrazing of the land

(7) Curiosity

(8) Fences (restrict movement)

c. Javelina

(1) Cougar

(2) Coyote

(3) Golden Eagles

(4) Parasites

(5) Drought

(6) Brush eradication

6. Management needs

a. Supply the four basic requirements of life

(1) Desirable food

(2) Sufficient cover

(3) Water

(4) Protection

b. Keeping under reasonable control out-of-season hunting

7. Value of deer, antelope and javelina

a. Valuable as a food

b. Valuable as a sport

c. Valuable as a cash crop to the landowner

d. Valuable of economic importance to towns - motels, restaurants, stores

C. Activities:

1. Field trips

2. Lecture by game warden or game biologist

3. Lecture by teacher

4. Pupil reports

VI. Evaluative Procedures

A. Paper and pencil tests - questions should be constructed so as to determine whether the general and specific objectives have been reached

B. Class discussion in which students are motivated to answer oral questions

C. Composition exercise with these suggested topics:

1. "What is the value of javelina, deer or antelope?"

2. "What does conservation of javelina, deer or antelope mean to me?"

3. "Types of country suitable for javelina, deer or antelope"

4. "How to provide adequate protection for javelina, deer or antelope"

5. "My first hunt for javelina, deer or antelope"

D. Physical check to see if available resource materials were adequately used:

1. Do you have materials that were not used?

2. What materials do you need as replacements or additionals?

3. Did you try to obtain additional information?

VII. Bibliography

A. Books, bulletins and pamphlets:

1. Complete Book of Hunting by Clyde Ormond, Harper and Brothers, New York, 1962

2. Hunting in Texas 1963-64, Parks and Wildlife Department, Austin

3. More Wildlife Through Soil and Water Conservation, United States Department of Agriculture, Washington

4. Texas Deer Herd Management by James G. Teer, Texas Parks and Wildlife Department, Austin, (Bulletin No. 44-1963)

5. The Deer of North America by Walter P. Taylor, Wildlife Management Institute, Washington, 1956

6. The Mammals of Texas by William B. Davis, Texas Parks and Wildlife Department, Austin, (Bulletin No. 27-1960)

ED042640

An Instructional Unit

Forestry

Junior High School

Correlate with Social Studies

SE 009 766

FORESTRY

I. Area of conservation involved (forestry)

II. Topic: Formation and Conservation of our Forests

III. Objectives

A. General objectives:

1. To develop an understanding of the meaning of the term "natural resource"
2. To develop an understanding of man's dependence upon trees, one of the principle natural resources
3. To develop an understanding that some natural resources, as trees, are renewable and some are not
4. To develop an understanding that forest conservation means the wise use of our forest resources
5. To develop an understanding that good forest conservation practices may provide more natural resources for more people for a longer period of time
6. To develop an understanding that many forest conservation practices exemplify man living in harmony with nature
7. To develop an understanding that the effectiveness of our States' forest conservation program depends on the attitude of our citizens
8. To develop an understanding that all living things are interrelated and interdependent

B. Specific objectives

1. To learn the principal forest regions of Texas

2. An appreciation of trees and forests

3. How forests are restored and perpetuated

4. The influence of forests upon the welfare of people

5. The location of state forests in Texas

6. The location of National forests in Texas

7. The importance of forests for:

   a. Employment
   b. Prevention of soil and wind erosion
   c. Watersheds
   d. Habitat for wildlife
   e. Recreation
   f. Aesthetics
   g. Wood products

8. Privately owned forests provide taxes to the State

IV. Introduction of topic

A. Questions related to what children already know about topic

1. Wasteful uses of our forests

2. Economic value of practicing wise forest conservation

3. Names and uses of Texas' important forest trees

4. Enemies of our forests

5. Forest fire prevention (poster work)

6. Tree farming

7. Recreational values of our forests

8. Forests are a renewable natural resource

B. Questions on part of teacher

1. What is the hydrobiotic cycle?

2. What methods are used to control forest enemies?

3. How is chemistry applied to wood products?

4. What is wood?

5. What is cellulose?

6. What governmental agencies are interested in forest conservation? State? National?

7. How do the economic values of timber affect our society?

8. What is meant by proper cutting practices?

9. What are the major physical properties of wood?

10. What is the relationship of forest conservation to other areas of natural resource conservation?

11. What are the Texas laws pertaining to forests?

C. Charts

Students make posters showing different phases of forest conservation or usage

D. Slides, Films, Etc

1. Pineywoods Partners, Park & Wildlife Department, Austin

2. Sound of America, Texas Forest Service, College Station

3. The Burning Issue, Texas Forest Service, College Station

4. Your Texas Forest Service, Texas Forest Service, College Station

E. Demonstrations

1. By outside resource people

2. By the teacher

3. By the students

V. Body of the Unit

A. Procedure

1. Display of forest products
2. Question the students to find out what they know or want to know
3. Class discussions
4. Programs by resource personnel
5. Field trips if possible
6. Audio-visual aids
7. Reports by students
8. Experiments

B. Content

1. By sound management practices, forests are a renewable natural resource
2. Tree farming in Texas
3. Factors which affect our forests as wildlife habitats
4. Name some products made from trees
   a. Fruit and resins
   b. Wood
   c. Fiber
   d. Chemical by products
5. Study a little of the chemistry of a tree
6. Learn to identify broad groups of trees
7. Discuss how woods from different kinds of trees have different uses
8. Compare the dollar value of a Southerpine tree when used for different products

9. Show how forests are of value by preventing soil and water erosion

10. Discuss the work done by private and public foresters

11. Study the state laws which pertain to Texas forests

12. Show how state and local areas benefit economically from state and local timber growing areas

13. Tell about the insects and diseases that attack trees and discuss the control methods employed

14. Teach of the effects of forest fires

15. Teach how to prevent forest fires

C. Activities

1. Field trips

2. Laboratory experiments

   a. Illustrate different wood textures
   b. Illustrate strength of different woods
   c. Chemistry experiment using wood

3. Pupil reports

4. Picture collections of interest related to the topic

5. Plan and hold an Arbor Day program

D. Continuity

This material will correlate with what has been taught and what will be taught

E. Vocabulary Terms

1. Osmotic pressure

2. Specific gravity

3. Cellulose

4. Hydrobiotic cycle

VI. Evaluation Procedure

A. Teacher made test

B. General discussion on material covered

C. Written reports

VII. Bibliography

"A Topical Outline for Conservation Education"
Sul Ross College, Alpine

Texas Forest Service, College Station

Texas Forestry Association, Lufkin

United States Department of Agriculture, Forest Service, Washington

Publications Available. U.S.D.A. Superintendent of Documents, U. S. Government Printing Office, Washington

Allen, Shirley W. Conserving Natural Resources New York: McGraw Hill, 1955

Weaver, Howard E. and Anderson, D. A. Manual of Southern Forestry, Danville, Ill., The Interstate Printers and Publishers, 1954 368 pp.

Elliott, Charles M. and Mobley, M.D. Southern Forestry. Atlanta: Turner E. Smith & Co., 1935

The Teaching of Conservation Resource-Use. Education Committee North Texas State College, Denton

Conservation Handbook. National Association of Biology Teachers Danville, Illinois: Interstate Printers

Forests and the Natural Water Cycle. Washington 25, D. C. U. S. Department of Agriculture Forest Service

Estimating Pine Sawtimber. Texas Forest Service A & M College System

Texas Forest Laws. Texas Forest Service Texas A & M University System

Forest Tree Improvement Program. Texas Forest Service A & M University System. Circular 77

Texas Regions of Trees. Texas Forest Service Circular 75